File Copy ESD-TR-70-60 ESD ACCESSION LIST ESTI Call No. 68968

Copy No. / of

/_ 01 ____ cys.

RADIO REFRACTIVITY AND METEOROLOGICAL DATA PLOTS FROM RADIOSONDE LAUNCHES TRADE WINDS - MARCH 1969

CHAPTRONIC

L. G. Rowlandson
J. S. Schwarz

ESD RECORD COPY

RETURN TO

SCIENTIFIC & TECHNICAL INFORMATION DIVISION
(ESTI), BUILDING 1211

January 1970

AEROSPACE INSTRUMENTATION PROGRAM OFFICE ELECTRONIC SYSTEMS DIVISION AIR FORCE SYSTEMS COMMAND UNITED STATES AIR FORCE L. G. Hanscom Field, Bedford, Massachusetts 01730

This document has been approved for public release and sale; its distribution is unlimited.

(Prepared under Contract No. F19628-68-C-0208 by Syracuse University Research Corp., Merrill Lane, University Heights, Syracuse, New York 13210.)

LEGAL NOTICE

When U.S. Government drawings, specifications or other data are used for any purpose other than a definitely related government procurement operation, the government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

OTHER NOTICES

Do not return this copy. Retain or destroy.

RADIO REFRACTIVITY AND METEOROLOGICAL DATA PLOTS FROM RADIOSONDE LAUNCHES TRADE WINDS - MARCH 1969



L. G. Rowlandson
J. S. Schwarz

January 1970

AEROSPACE INSTRUMENTATION PROGRAM OFFICE ELECTRONIC SYSTEMS DIVISION AIR FORCE SYSTEMS COMMAND UNITED STATES AIR FORCE L. G. Hanscom Field, Bedford, Massachusetts 01730

This document has been approved for public release and sale; its distribution is unlimited.

(Prepared under Contract No. F19628-68-C-0208 by Syracuse University Research Corp., Merrill Lane, University Heights, Syracuse, New York 13210.)

FOREWORD

This report is prepared for the

Aerospace Instrumentation Program Office Electronic Systems Division Air Force Systems Command of the United States Air Force L. G. Hanscom Field Bedford, Massachusetts

Air Force Program Monitor - Lt. C. Schafer, FSD/FSSIF Project Number 6684, Task 6684.08

covering research over the period

1969 March 1 to 1970 January 31.

Prepared under Contract No. F19628-69-C-0208 by

Syracuse University Research Corporation Merrill Lane, University Heights Syracuse, New York.

This report was reviewed and approved.

C. Schafer, Lieutenant, USAF Program Manager for FSD/FSSIF/6684.

ABSTRACT

Radiosonde data were collected from the Northern part of the Caribbean Sea, during the period 6 March through 26 March 1969. Stations were selected to encompass the area wherein instrumented aircraft measurements were made of meteorological and radio refractivity parameters.

TABLE OF CONTENTS

			Page
Section	ı I Int	roduction	1
Section	n II Da	ta Presentation	. 5
		·	
		•	
•			
	•		
		· ·	
•		LIST OF ILLUSTRATIONS	
Figure	•	T 1 611	Page
l	Radiosono	e Launch Sites	7
			•
		LIST OF TABLES	
Table		•	Page
1	Radiosond	e Stations Used in the Analysis	6

vi

SECTION I

INTRODUCTION

An investigation of the characteristics of the Trade Wind Duct was carried out from 6 March through 25 March 1969. Detailed data were collected using a USAF C-131 aircraft which was instrumented to measure free air variables as well as radio refractivity [Reference: Rowlandson, et al, "Measurements of Meteorological Parameters and Radio Refractivity in the Caribbean," ESD-TR-69-374, November 1969]. The aircraft proceeded from Key West, Florida, on a counter-clockwise flight to New Orleans, Merida, Cayman Islands, Puerto Rico, Grand Bahamas, and back to Key West.

Large variations occur in time and space over this area and it was necessary to use radiosonde data to control the experiment. In addition, detailed analysis of the weather conditions along the various paths flown by the aircraft required extensive radiosonde data. The analysis of all data then attempts to show how the characteristics of the Trade Wind Duct change in relation to the controlling weather systems.

The data presented herein show the vertical variation of radio refractivity, N, modified index, M, air temperature, T, water vapor pressure, e, and potential air temperature, θ .

These data will be presented in a chronological order and identified by aircraft mission numbers so they may be related to measurements and data presented in the earlier reports.

Several parameters associated with these measurements should be clearly defined. The first is the radio refractivity, N, and the modified index of refraction, M, both of which play an important role in determining the relationship of the Inversion characteristics to radio wave propagation.

The computer programs used to process and present these data were described earlier [Schwarz, J., "Description of Computer Programs for the Analysis and Presentation of Trade Winds Data," ESD-TR-70-32, December 1969].

The index of refraction, n, for air is related to the refractivity, N, and free air variables by the expression

$$(n-1) 10^6 = N$$
 (1)

$$= \frac{77.6 \text{ P}}{\text{T}} + \frac{3.73 \times 10^6 \text{ e}}{\text{T}^2}$$
 (2)

where P = the air pressure (mb)

T =the air temperature ($^{\circ}$ K)

e = the water vapor pressure in the associated sample of air (mb).

To maintain hydrostatic equilibrium, the pressure, P, decreases almost exponentially with height and has such an overwhelming influence on N, that in general it is found that N also decreases exponentially with height. Variations from this average behavior are primarily due to the water vapor pressure term, e.

When a radio signal is propagated and its travel defined by a single ray, the variations of N along its path produce changes in its velocity and its direction of travel. These considerations are well documented and do not need to be presented herein. In the study of radio ray propagation it is frequently convenient to transform the geometry to a flat earth and treat the problem in Cartesian rather than in polar coordinates. This transformation changes the normal decrease of N with height, over the curved earth, to an apparent increase of N with height over the flat earth.

The new index, M, resulting from this transformation then becomes

$$M(h) = N(h) + h/a \cdot 10^6$$
 (3)

where h = the height above the earth's surface a = the earth radius.

Another parameter, the potential temperature, θ , is of particular importance when studying the Trade Wind Inversion. The potential temperature is given by

$$\theta = T \left(\frac{P}{1000} \right)^{-R_0/C} P \tag{4}$$

where T = the air temperature (° K)

P = the air pressure (mb)

R = the specific gas constant for air

C_n = the specific heat capacity for air at constant pressure

therefore.

$$R/C_p = 0.286 \text{ for dry air.}$$
 (5)

The potential temperature may be considered to be the temperature a sample of dry air would have if it were compressed (or expanded) adiabatically from a given state P and T to a pressure of 1000 mb. Therefore, 0, is a conservative property of a parcel of air which is invariant during adiabatic processes.

When an inversion occurs, such as in the case of the Trade Wind Inversion, the potential temperature increases very rapidly with height through the layer. This condition indicates that abnormal (non-adiabatic) heating occurs which is produced by the subsidence of the upper air. The vertical stability of the air is then greatly increased in the layer and the vertical transfer of air from the region below the layer is strongly inhibited.

It will be seen that any temperature advection that modifies the air, except for normal adiabatic processes, will have a marked effect on the vertical variation of potential temperature. Greater or lesser stability then occurs depending on the temperature change of the air from adiabatic.

.

,

SECTION II

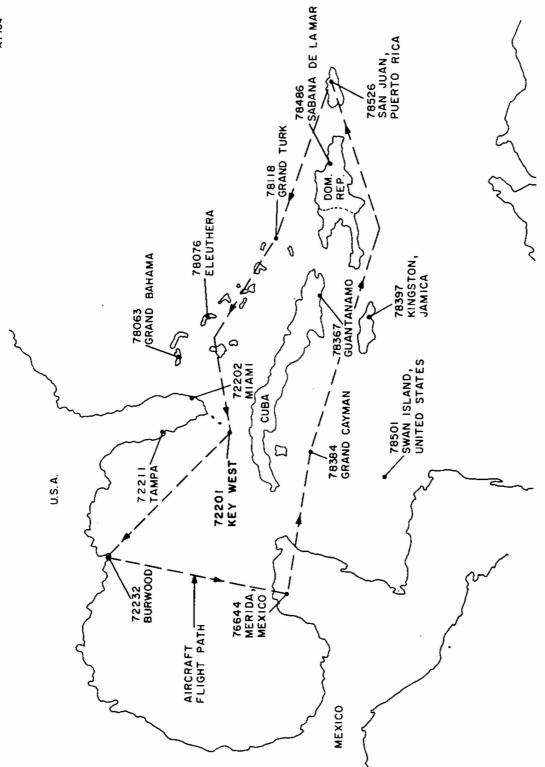
DATA PRESENTATION

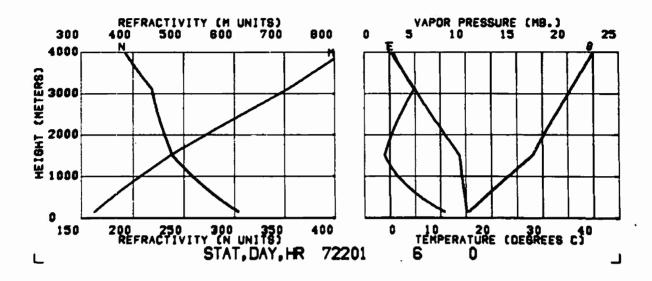
Approximately fifteen stations were selected for the analysis. These stations are listed below and their location and number shown on Figure 1.

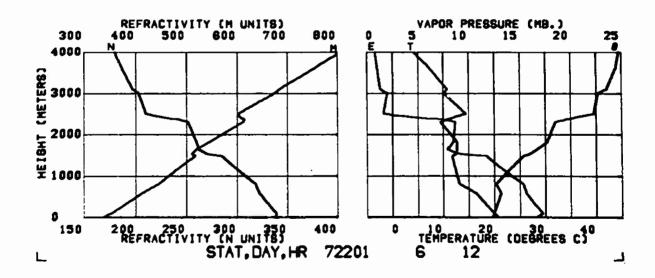
Since launches were inconsistent, the data for any given day has been assembled in the order of the station number. To show the diurnal effects, an attempt is made to present the 0000 Z launch directly above the 1200 Z launch for any given station. In some cases where launches were not made this procedure is waived in the interest of conserving space in the report.

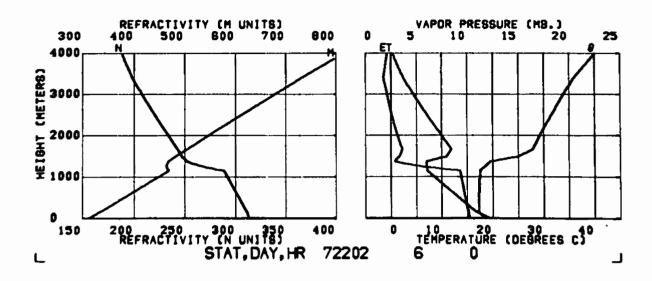
TABLE I
RADIOSONDE STATIONS USED IN THE ANALYSIS

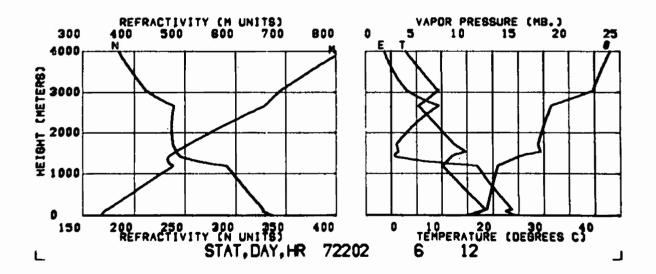
	-	
Station Symbol	Location	
72201	Key West, Florida	
72202	Miami, Florida	
72211	Tampa, Florida	
72232	Burwood, Louisiana	
76644	Merida, Mexico	
78063	Grand Bahama Island	
78076	Eleuthera	
78118	Grand Turk Island	
78367	. Guantanamo, Cuba	
78384	Grand Cayman Island	
78397	Kingston, Jamaica	
78486	Sabana de la Mar, Dominican Republic	
78501	Swan Island	
78526	San Juan, Puerto Rico	

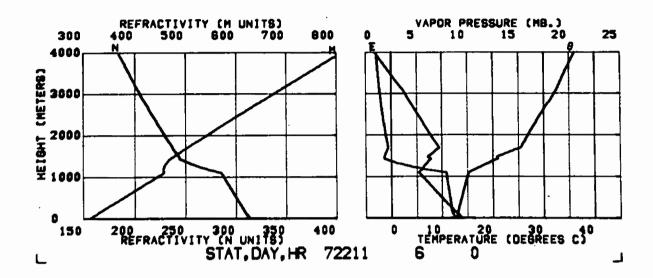


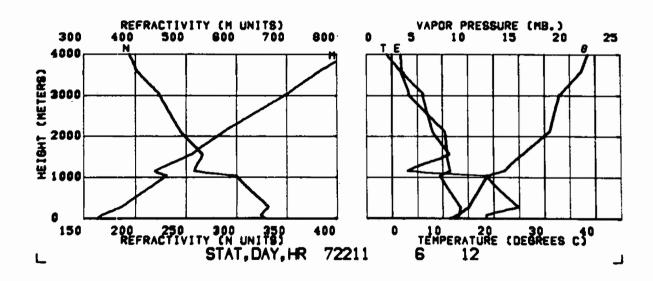


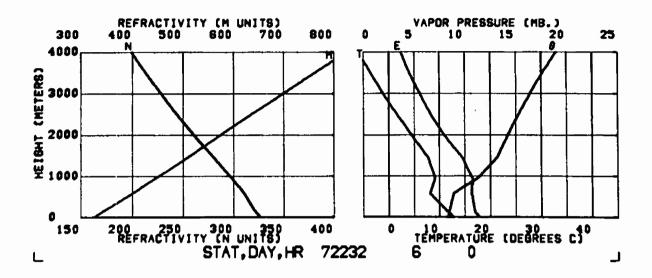


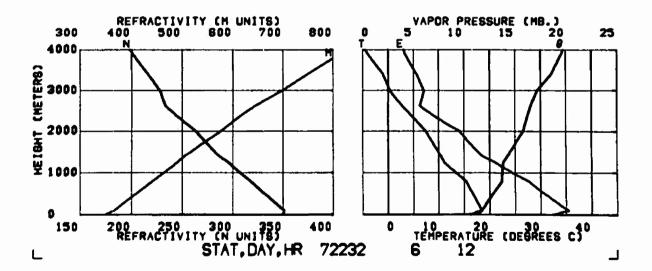


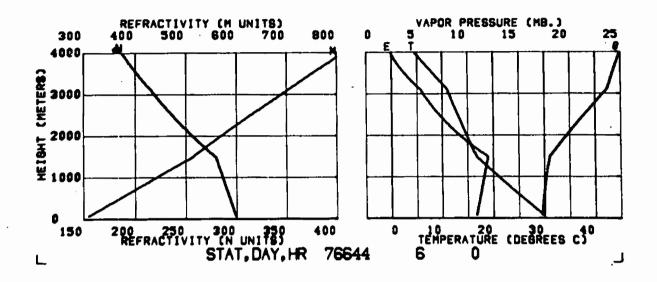


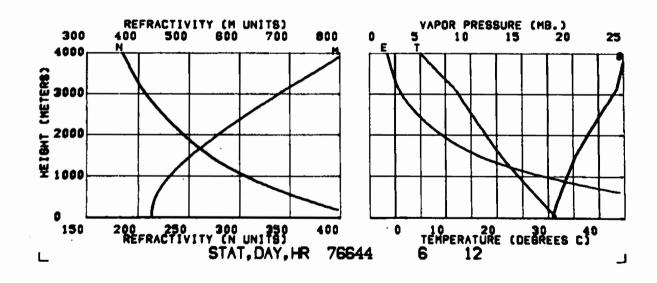


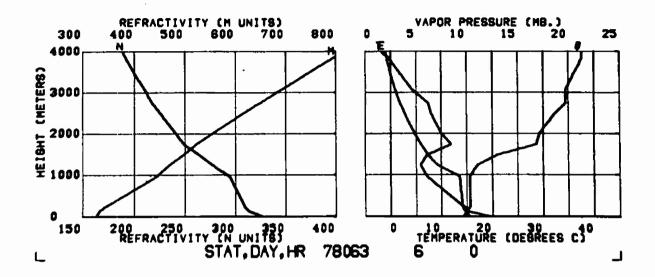


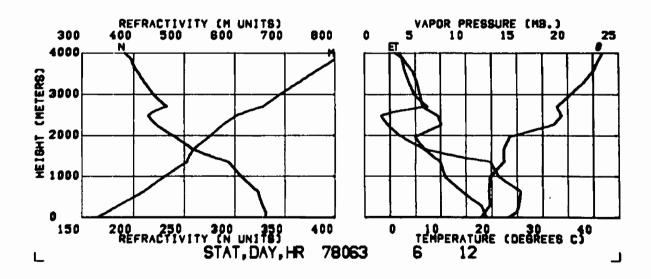


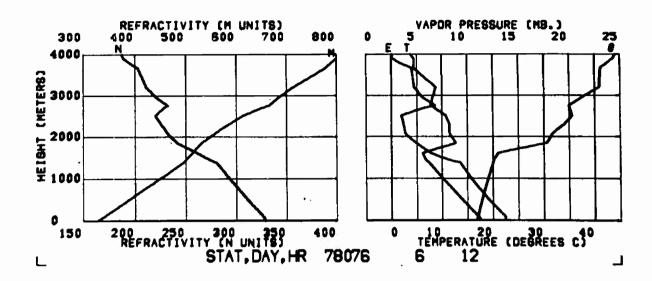


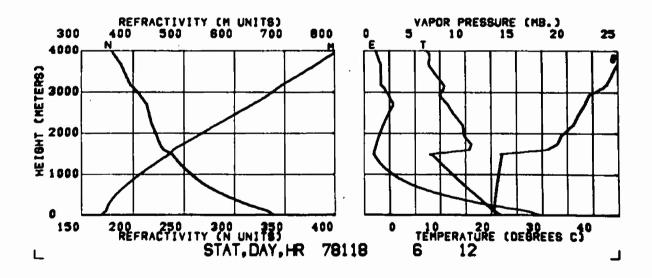


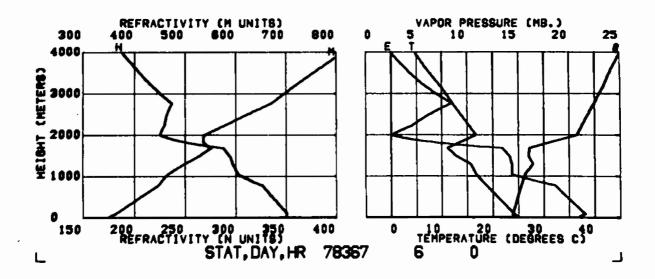


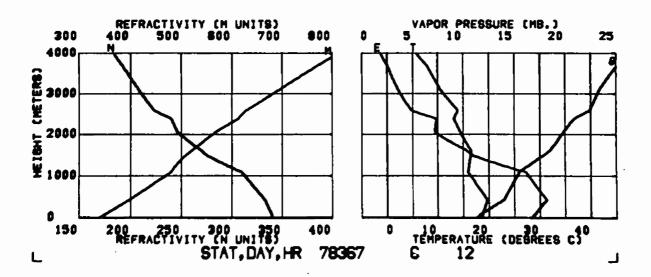


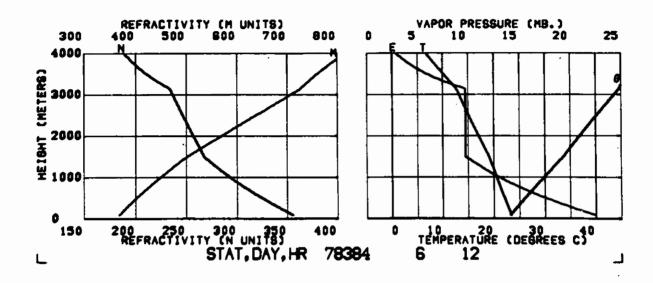


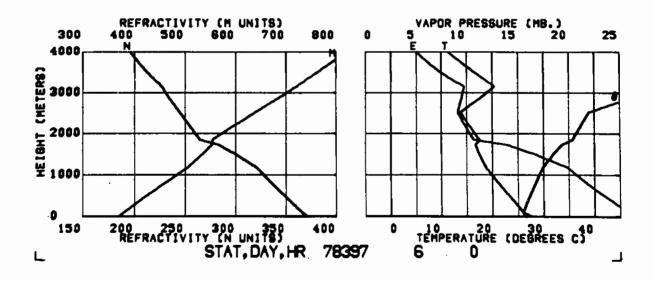


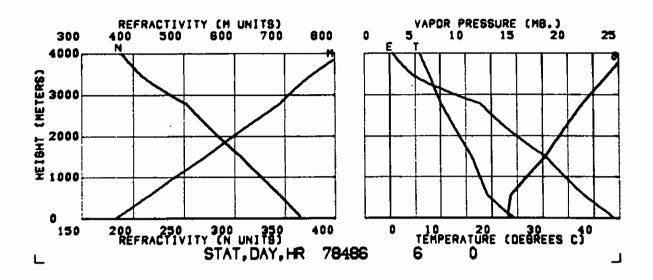


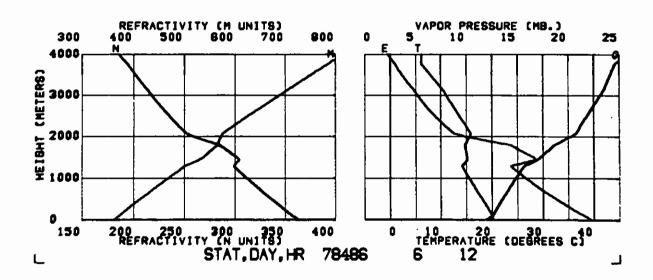


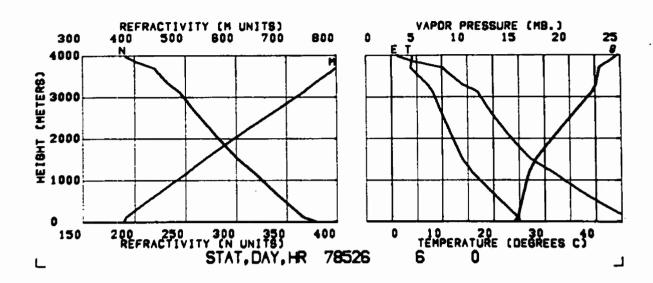


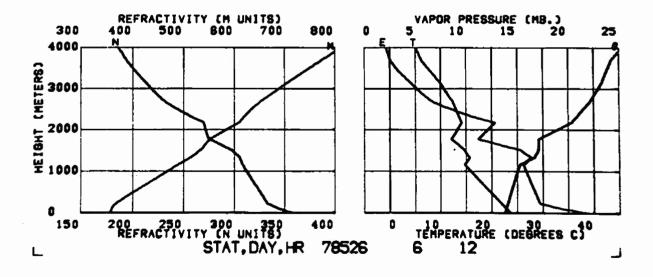


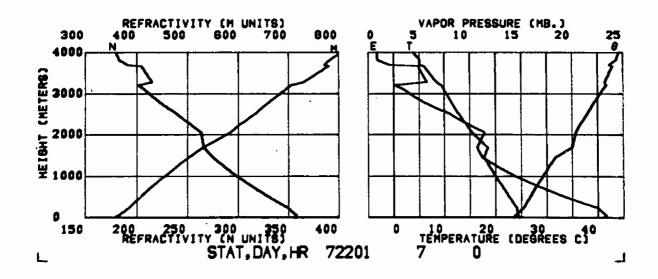


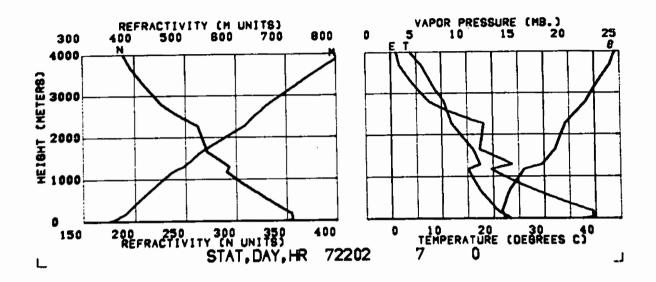


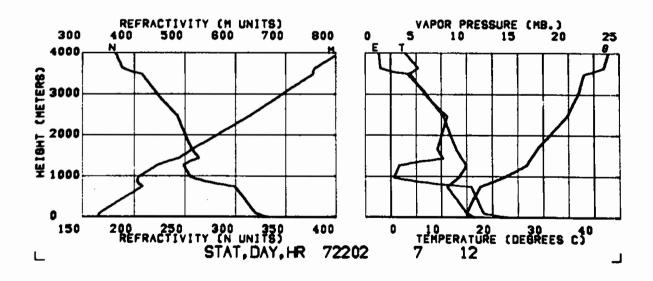


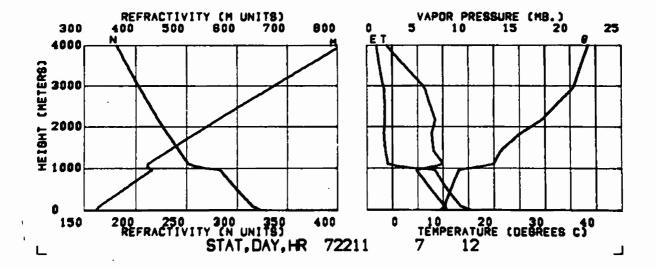


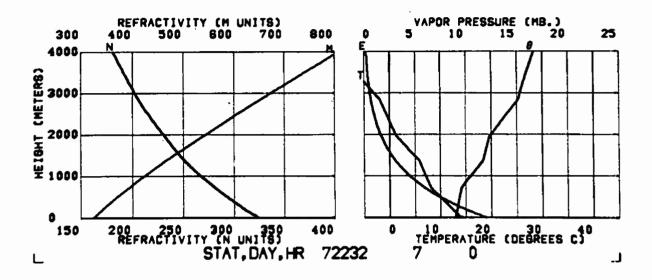


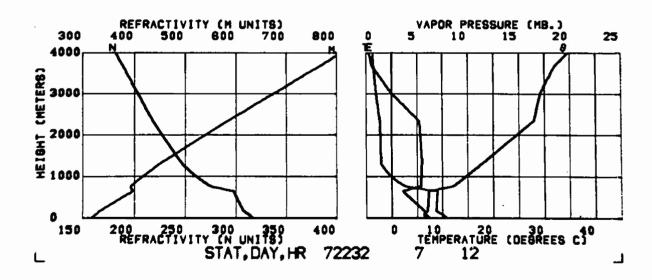


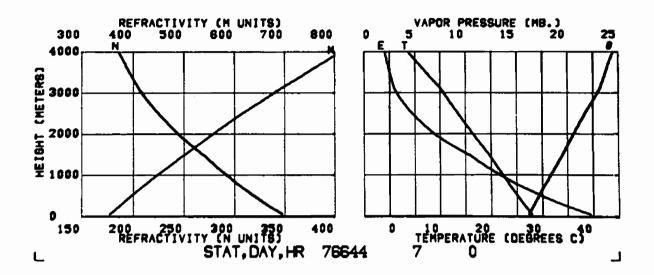


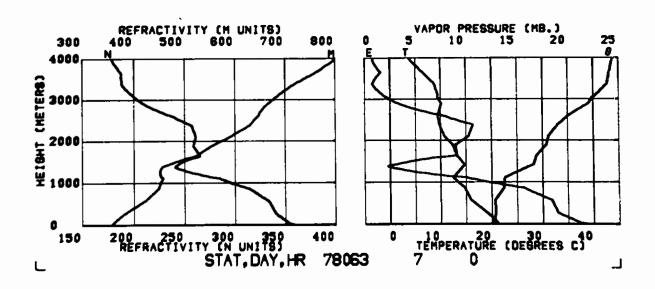


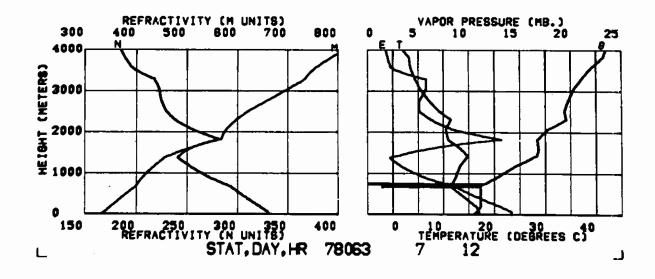


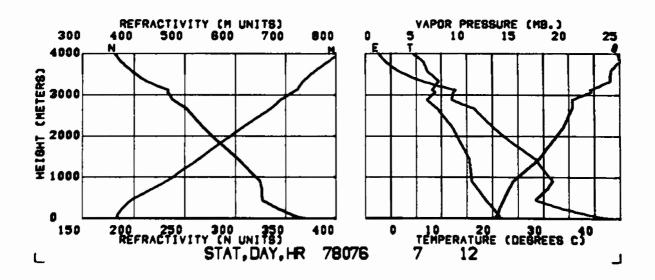


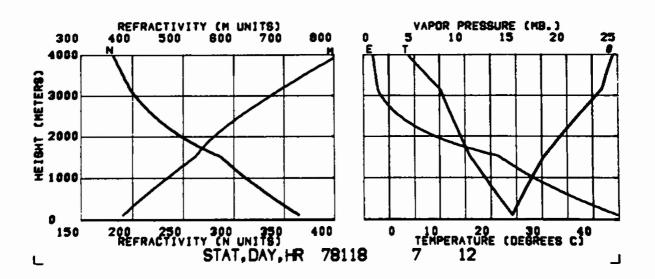


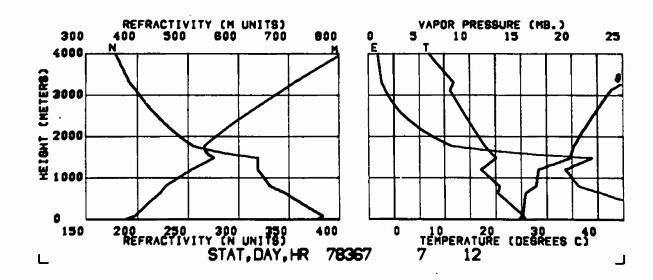


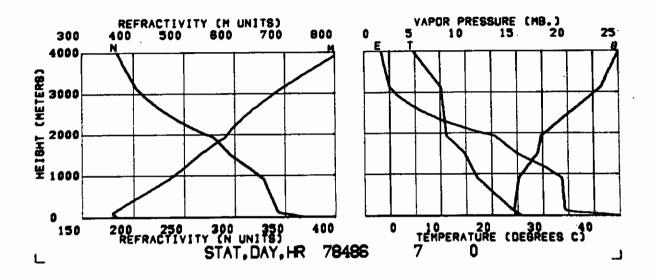


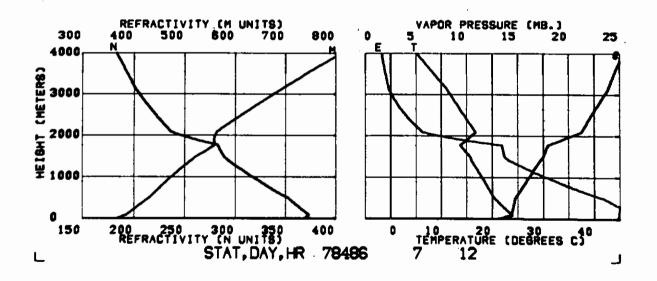


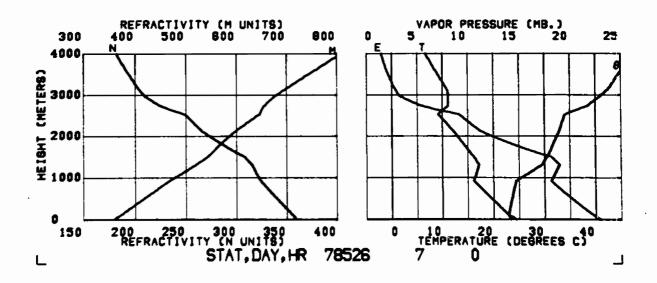


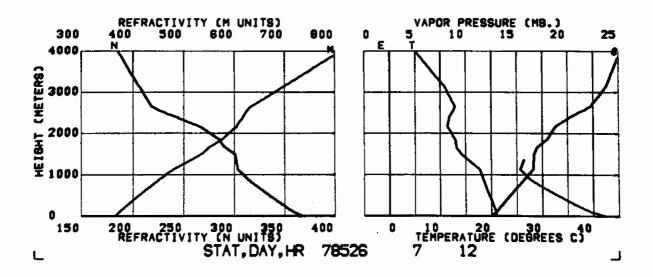


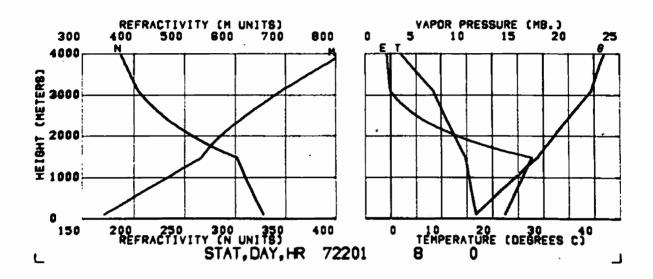


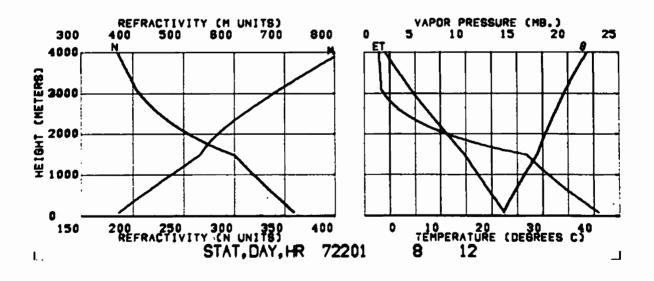


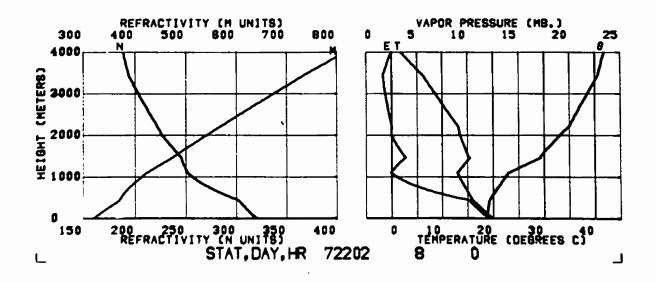


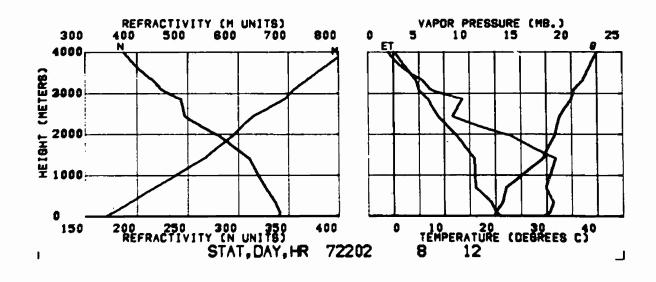


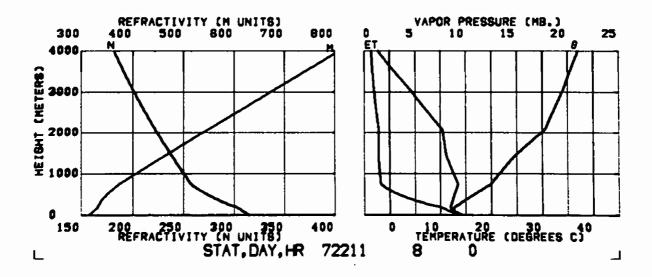


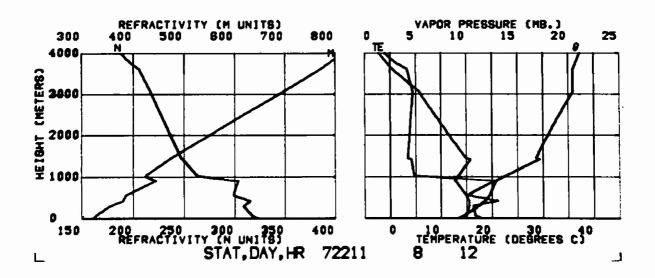


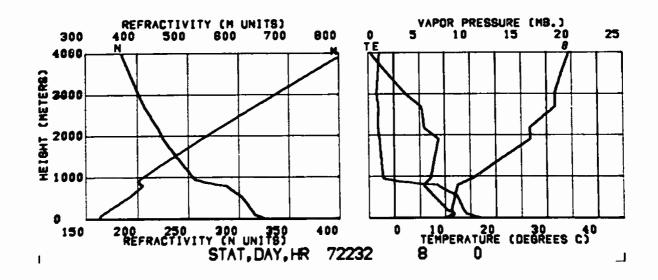


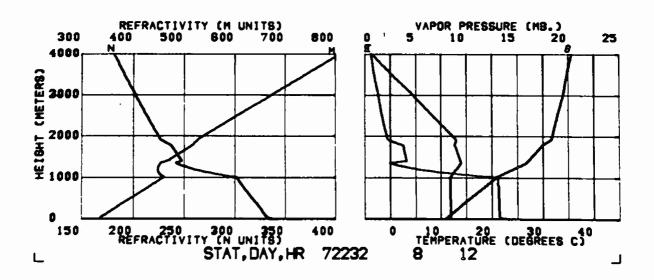


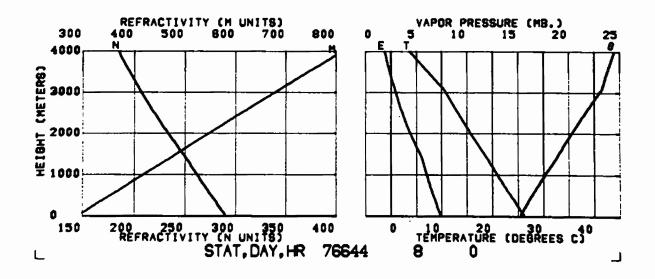


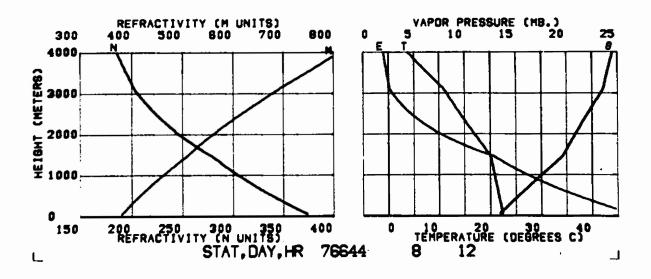


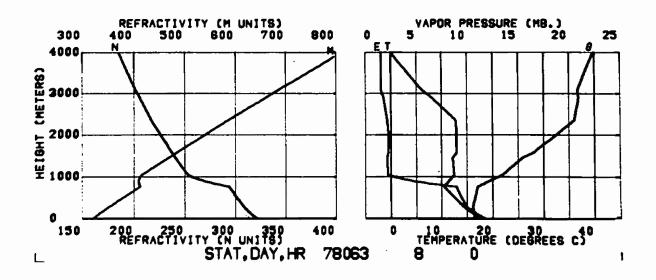


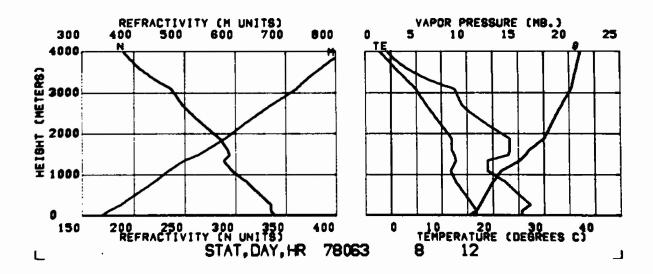


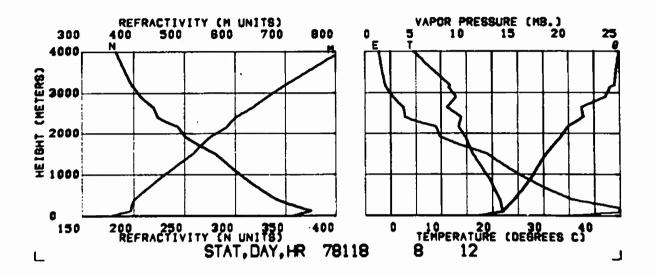


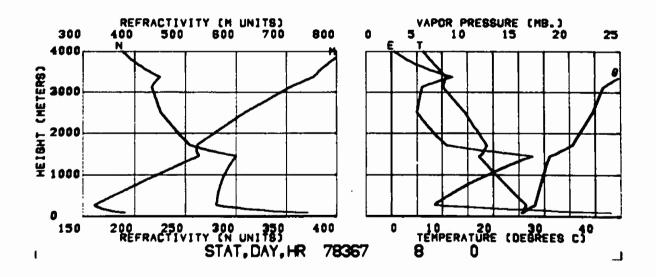


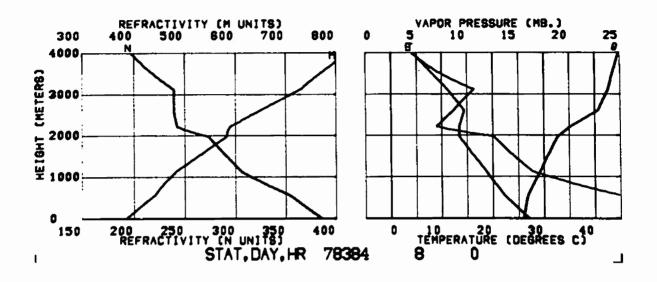


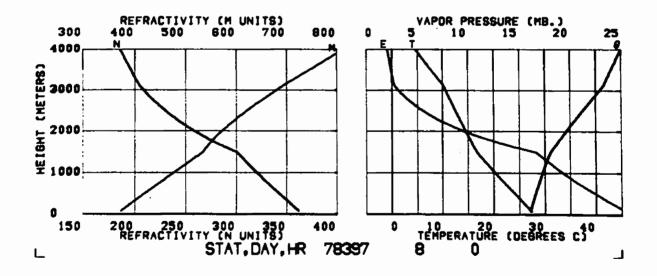


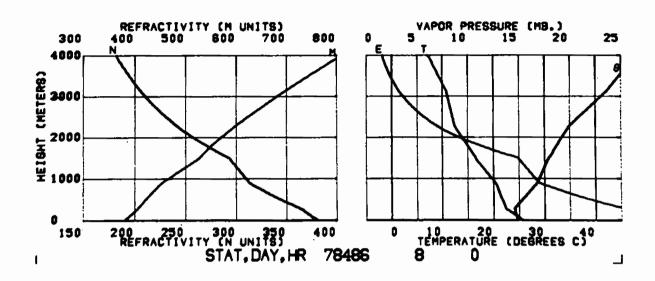


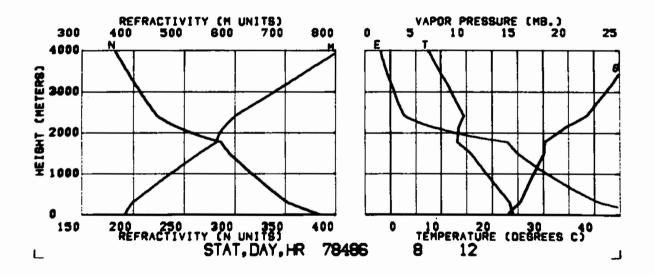


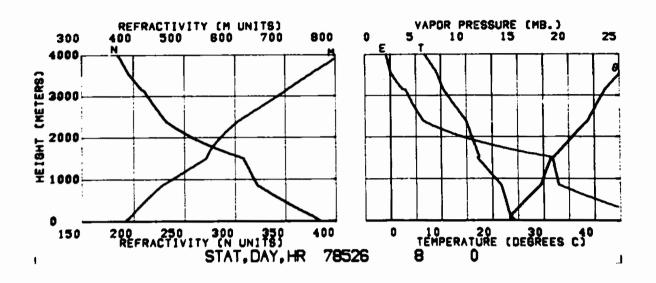


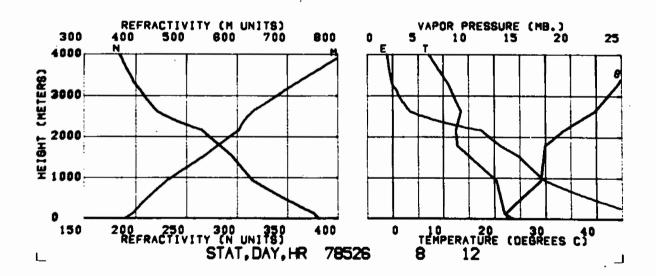


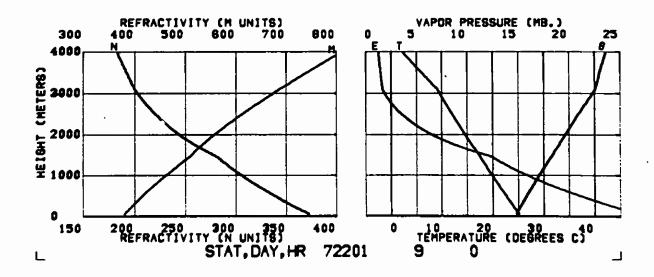


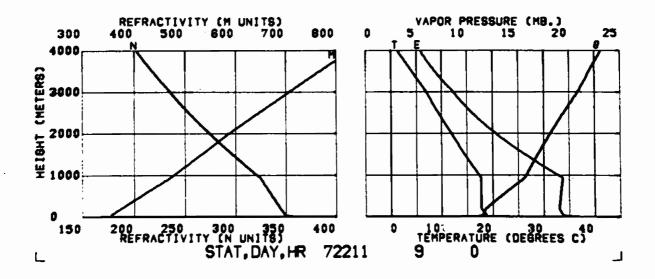


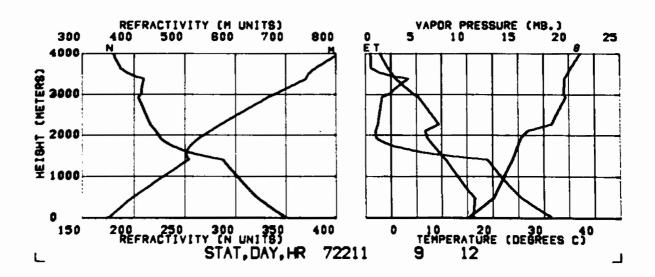


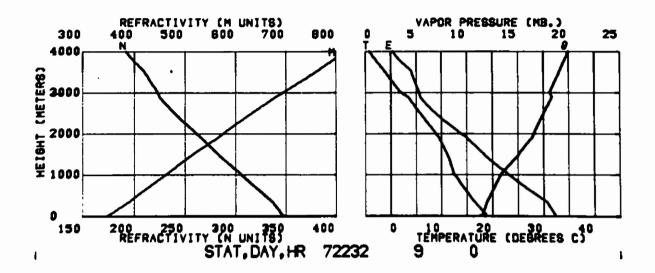


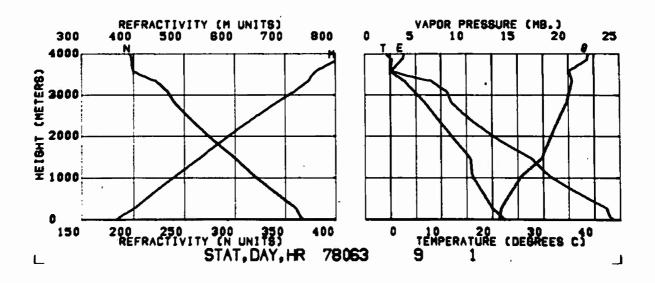


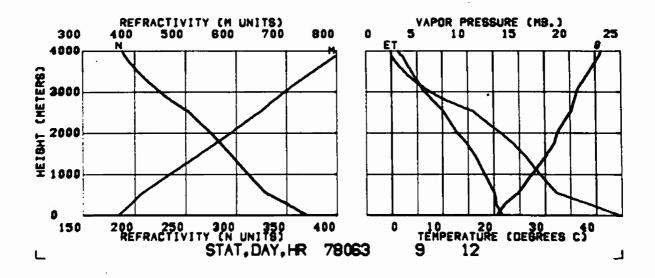


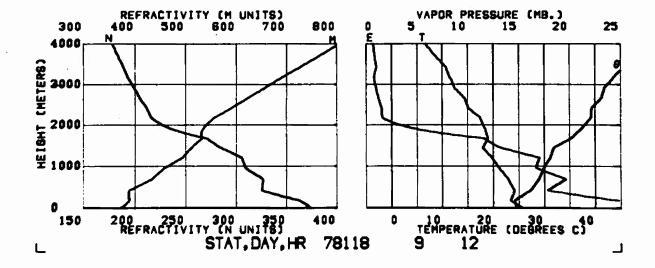


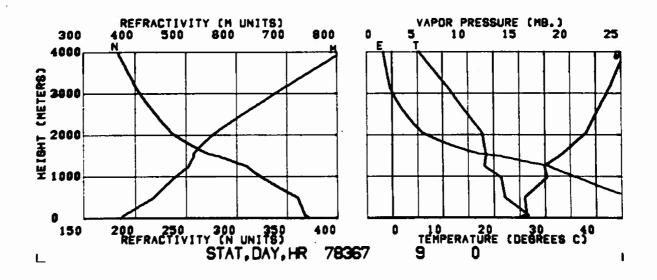


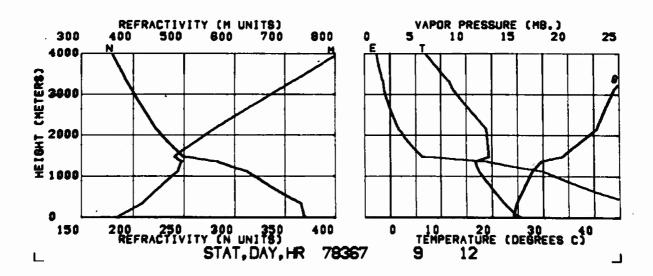


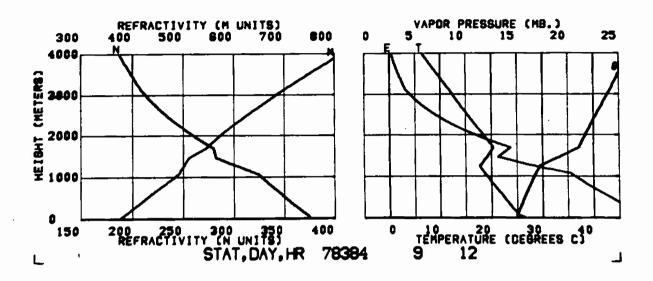


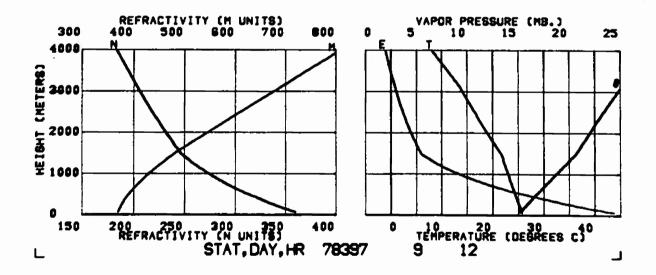


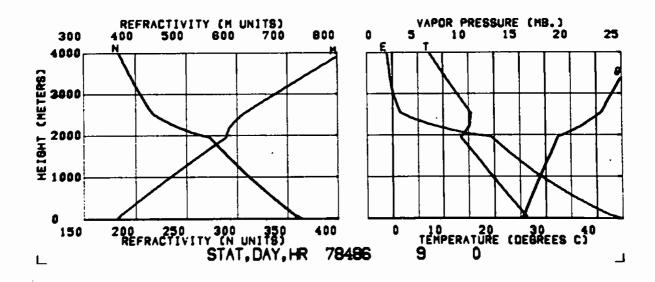


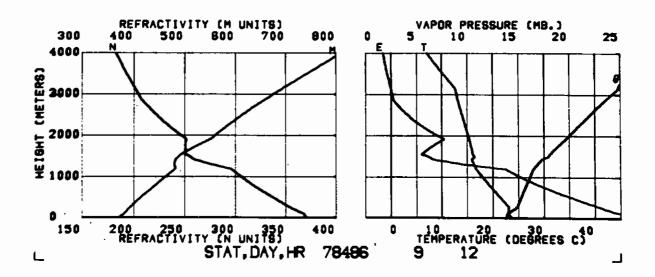


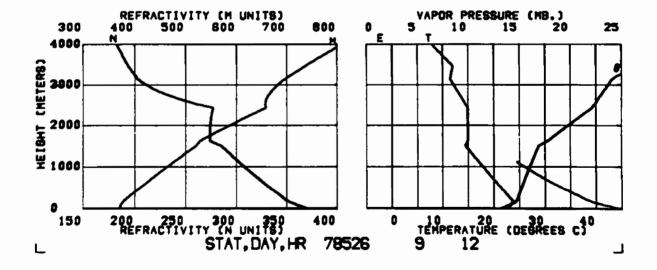


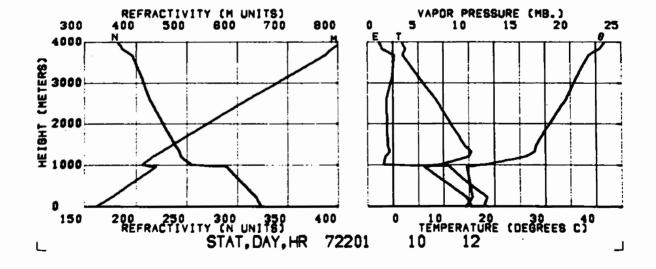


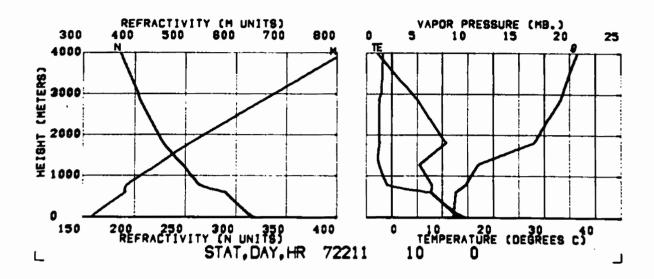


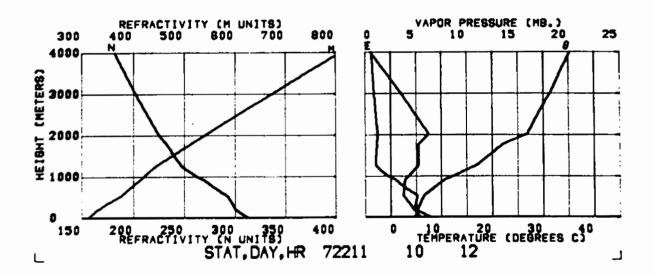


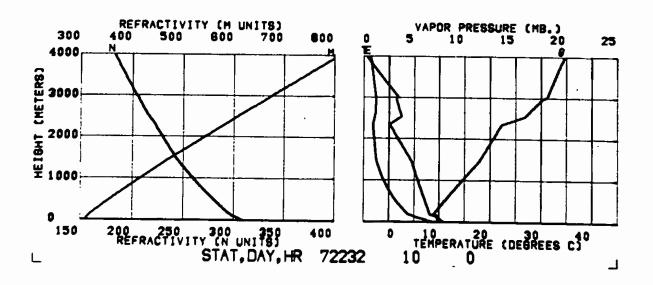


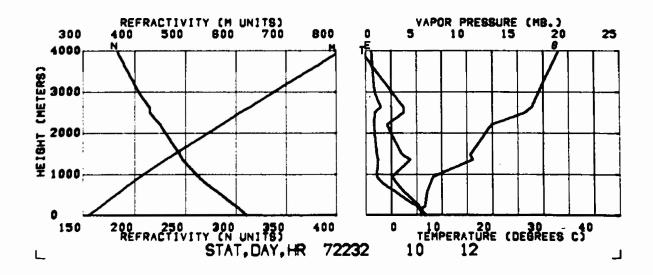


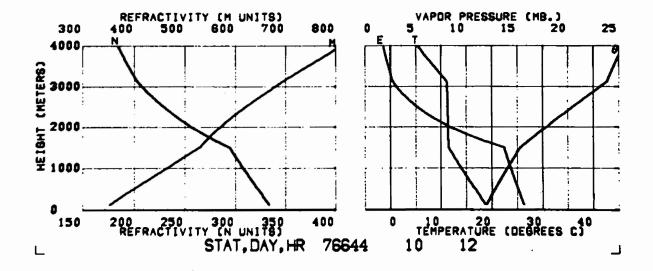


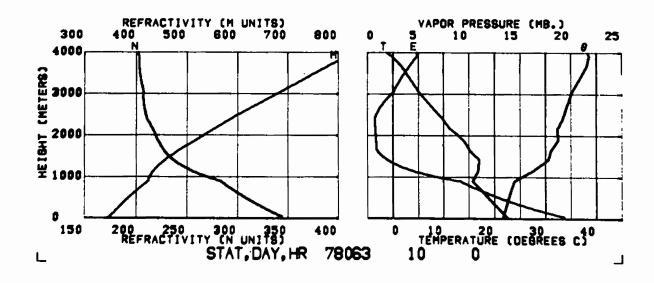


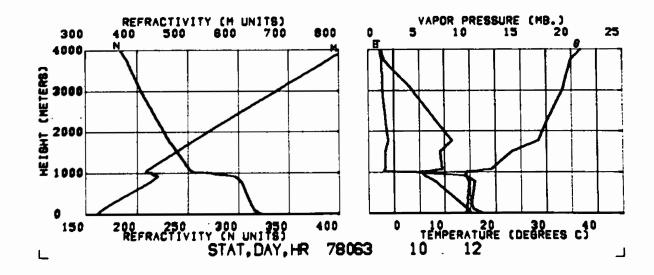


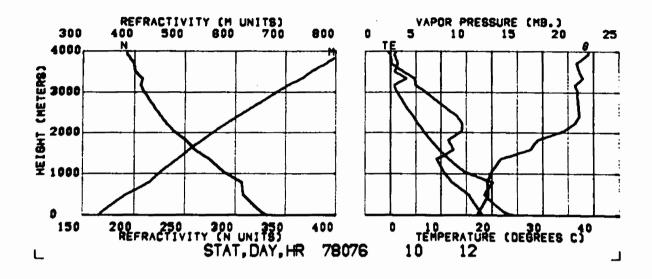


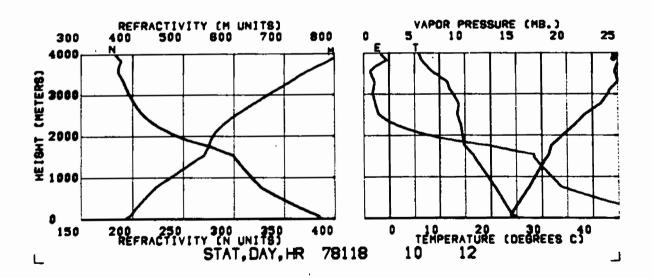


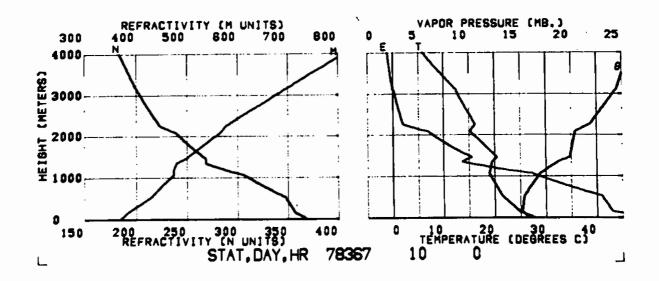


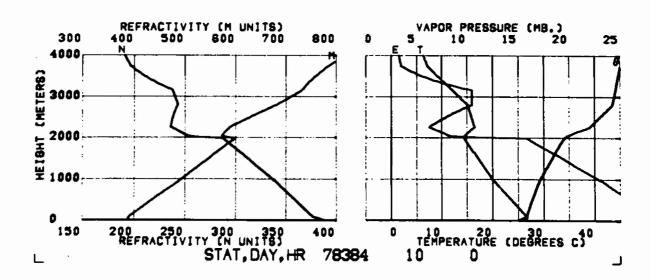


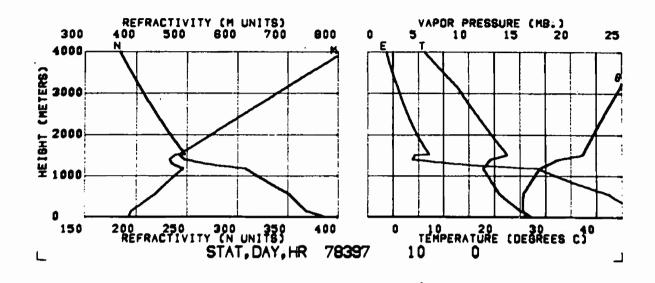


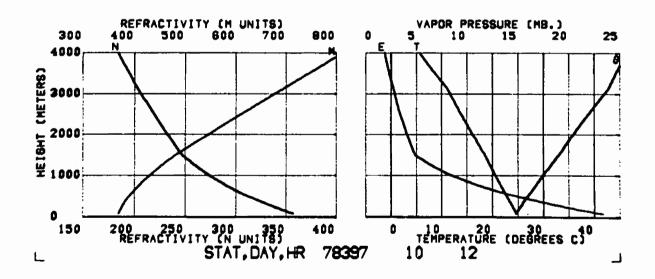


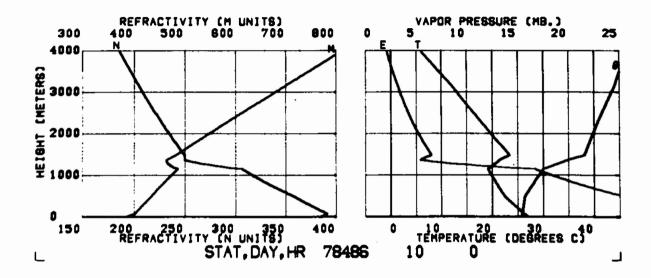


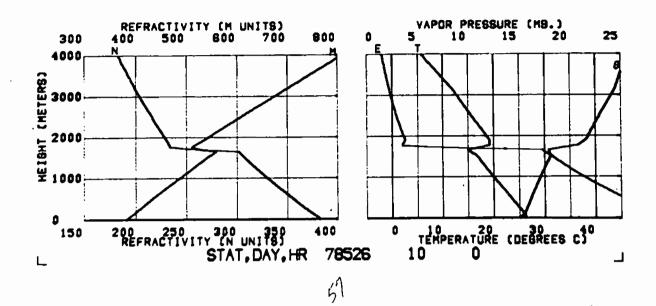


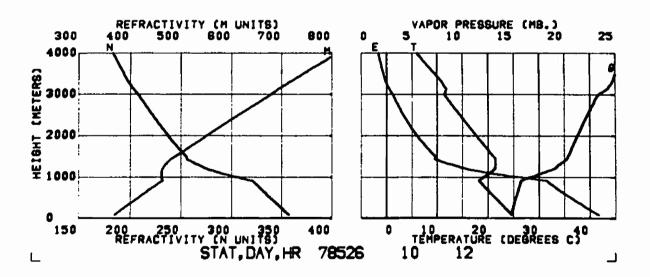


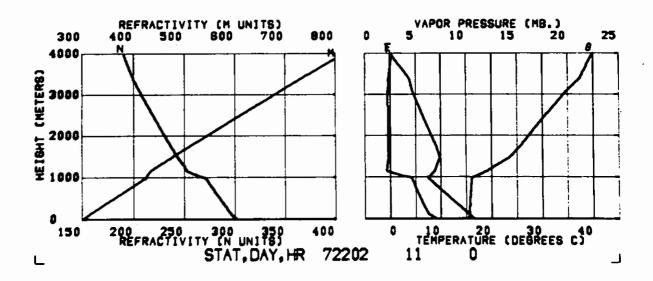


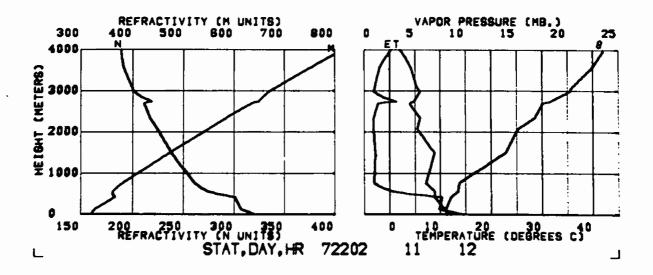


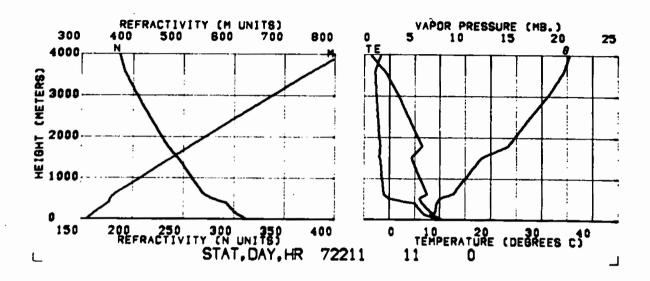


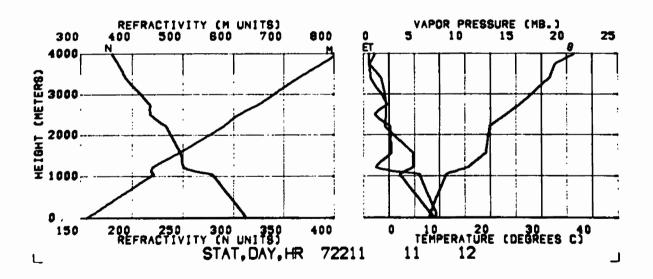


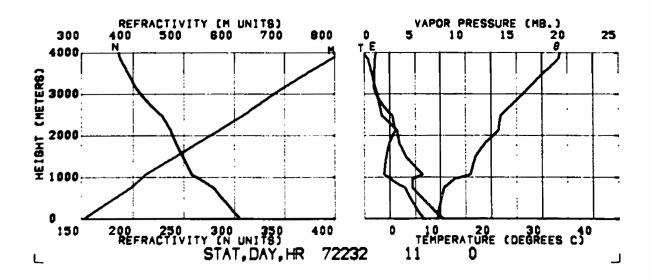


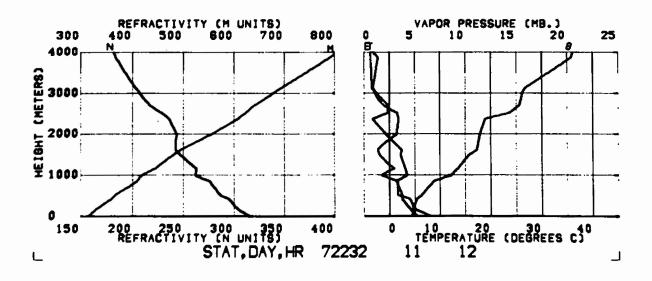


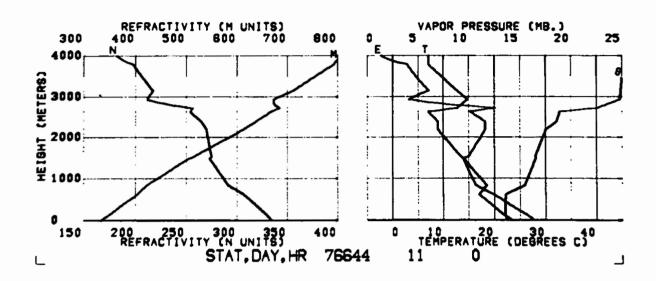


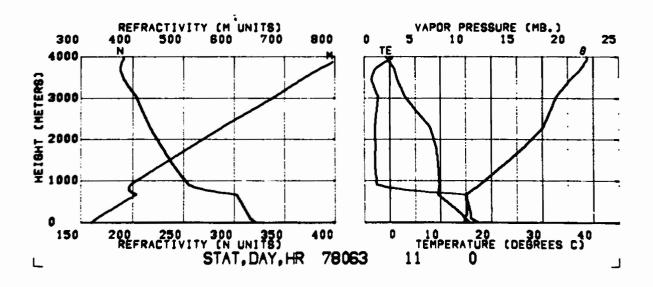


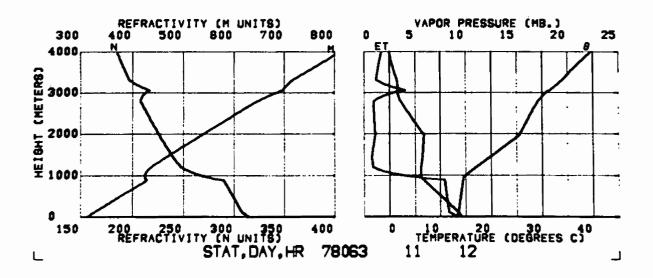


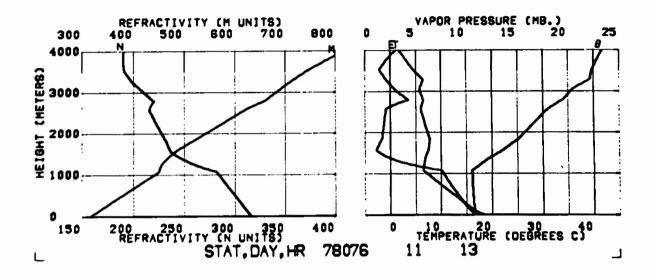


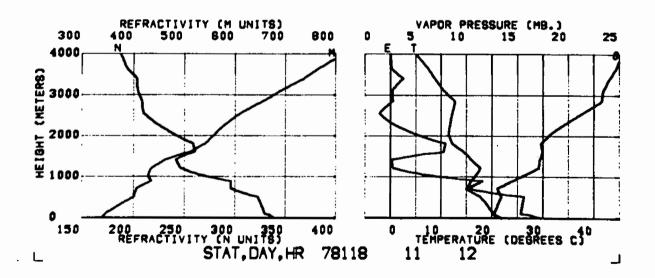


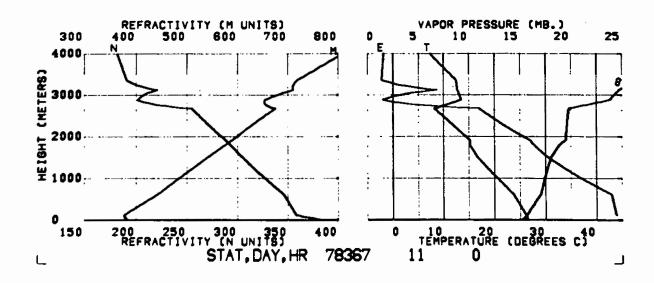


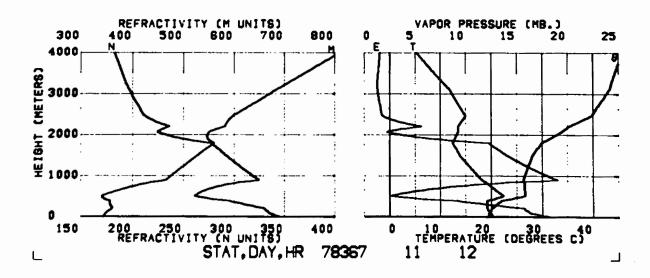


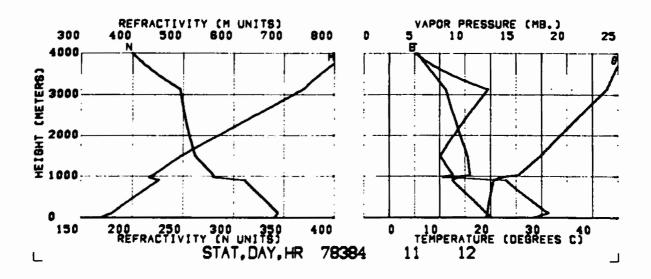


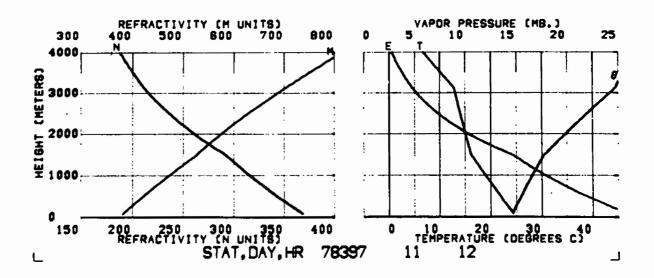


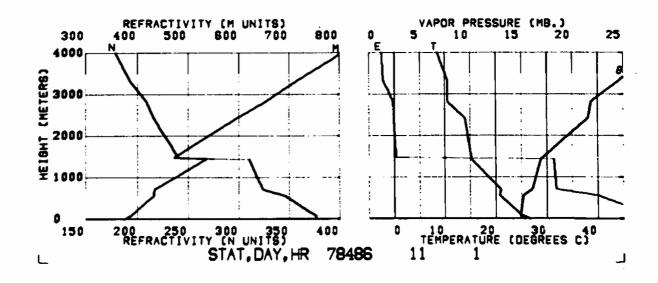


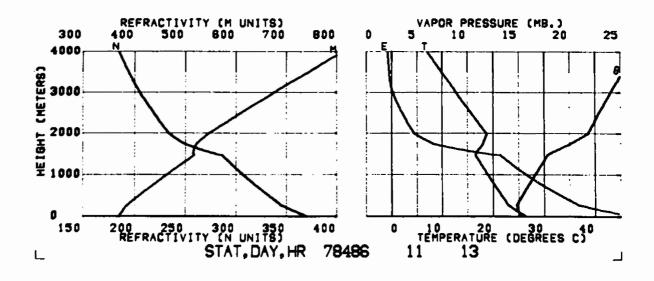


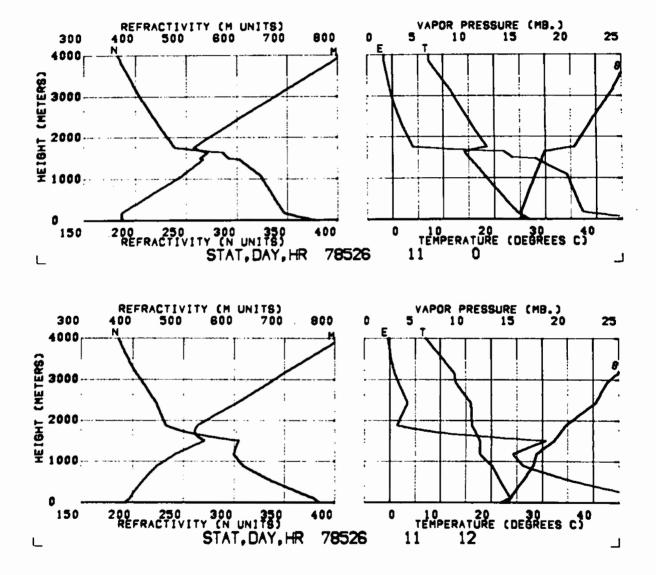


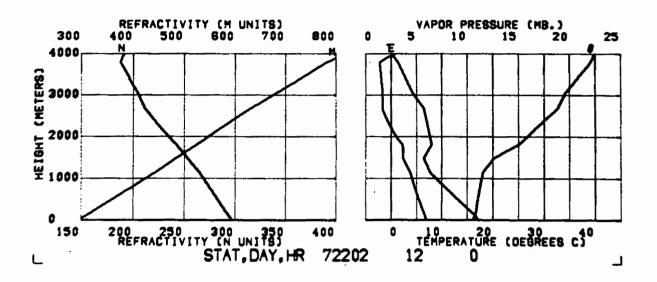


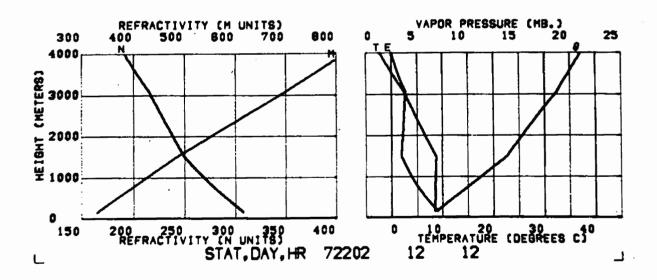


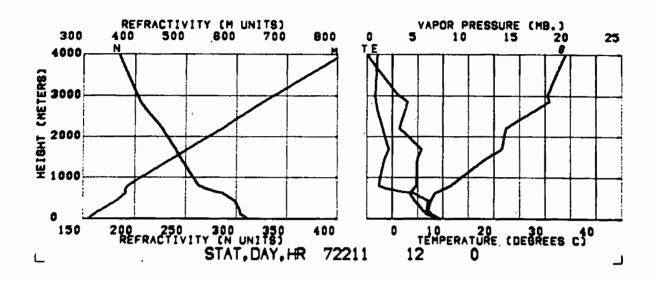


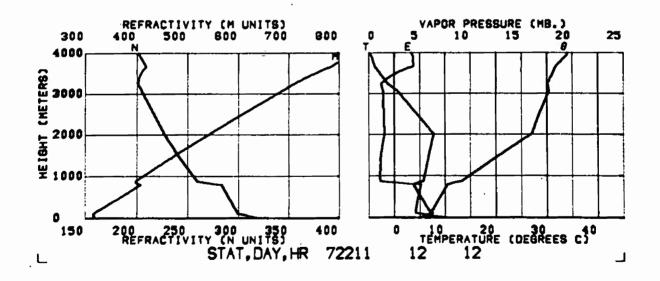


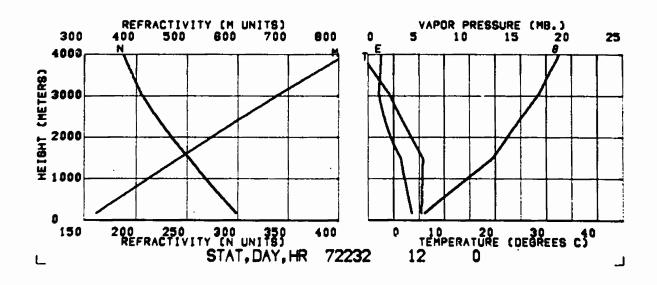


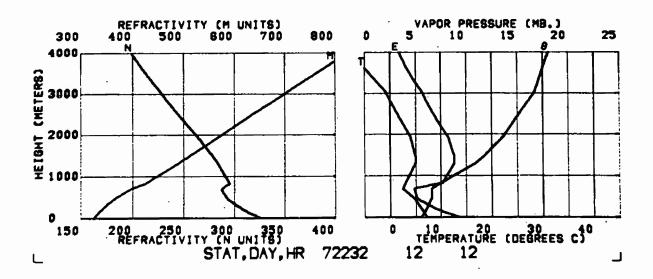


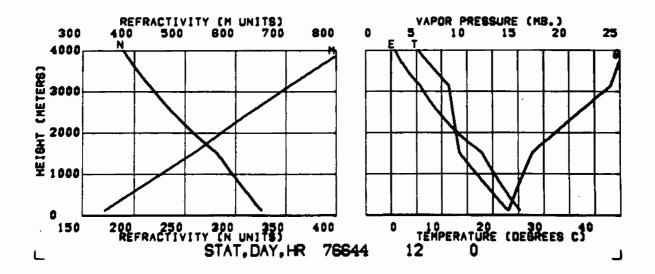


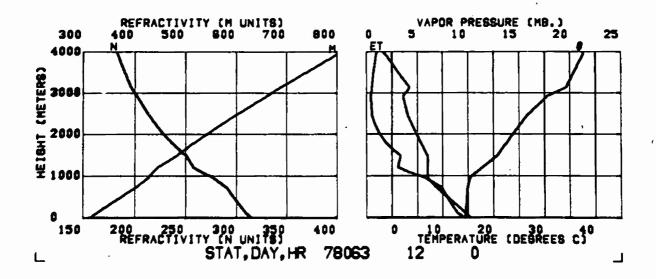


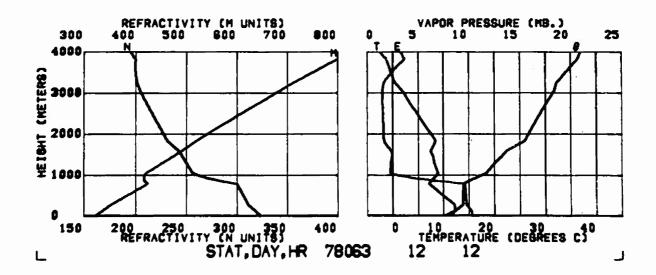


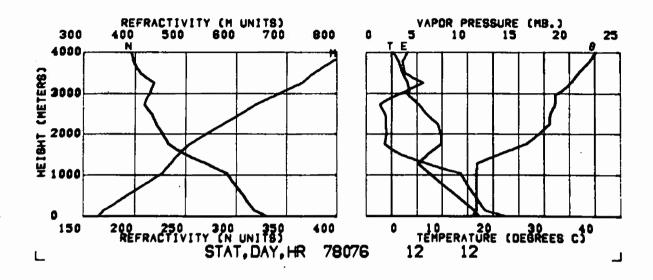


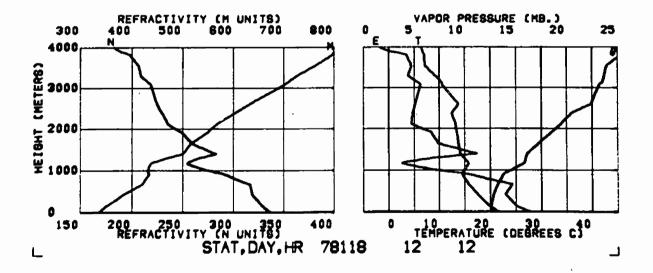


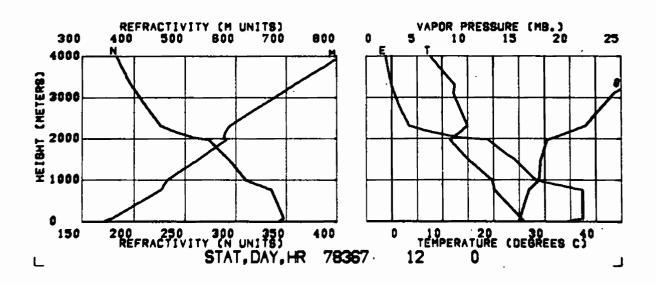


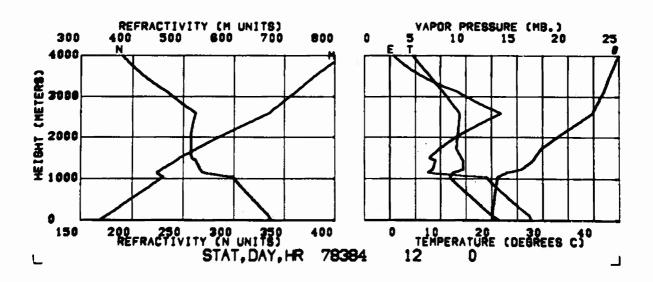


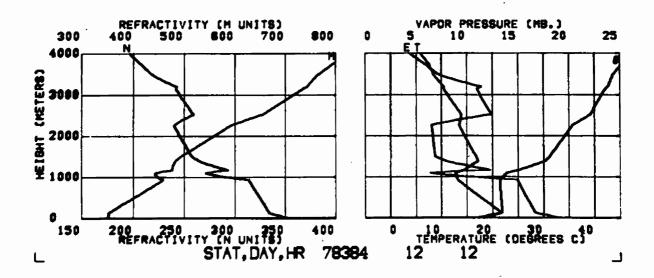


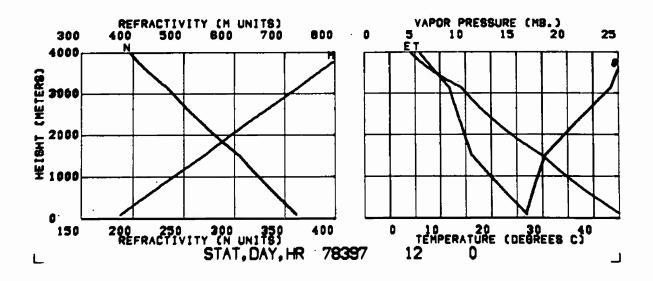


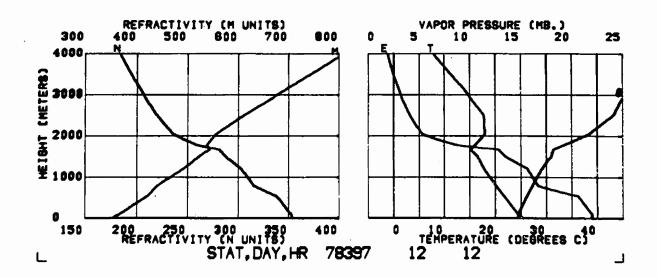


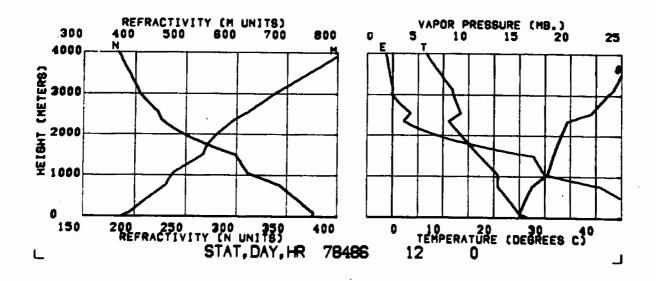


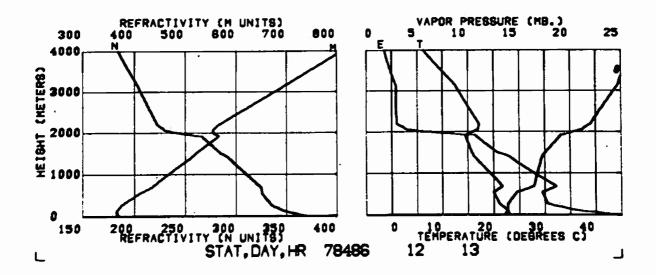


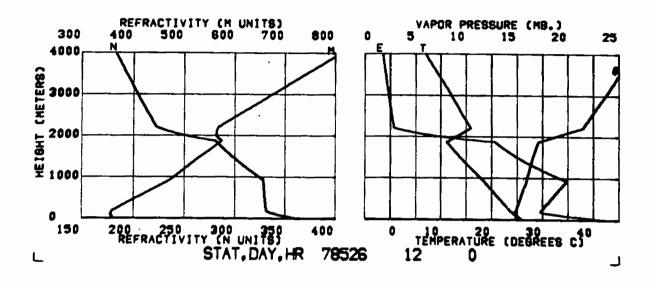


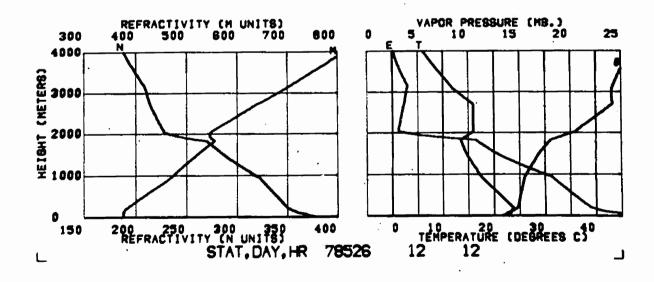


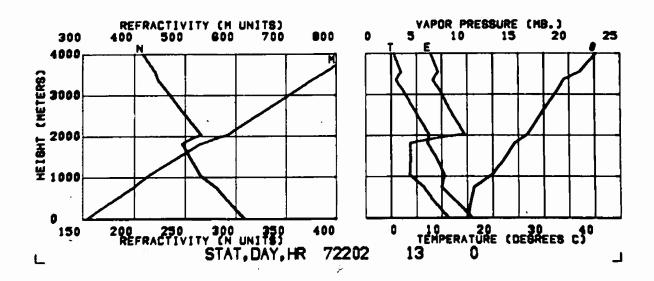


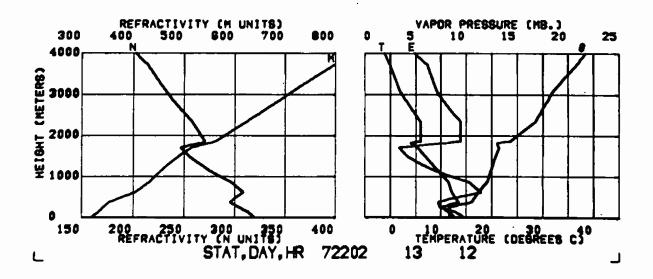


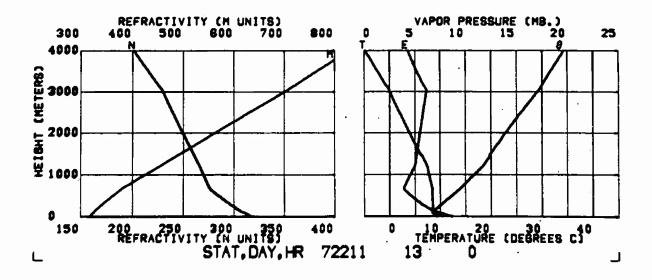


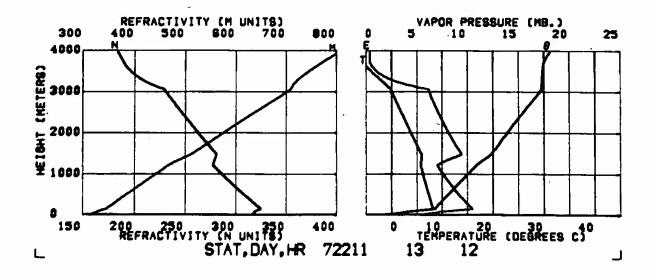


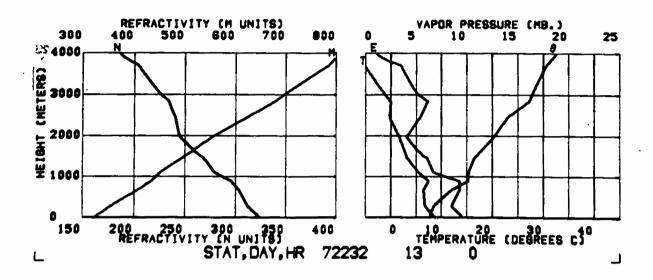


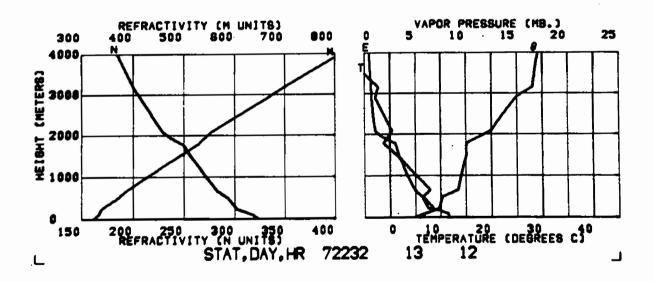


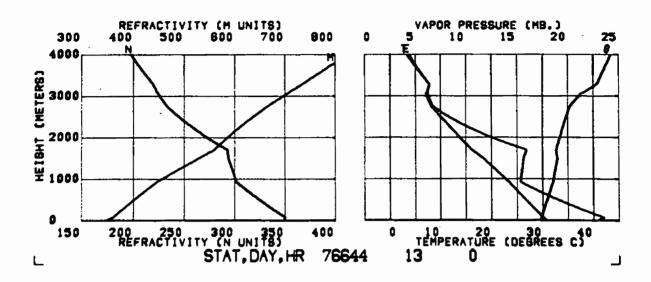


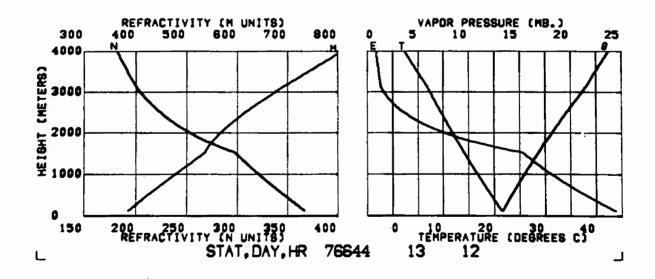


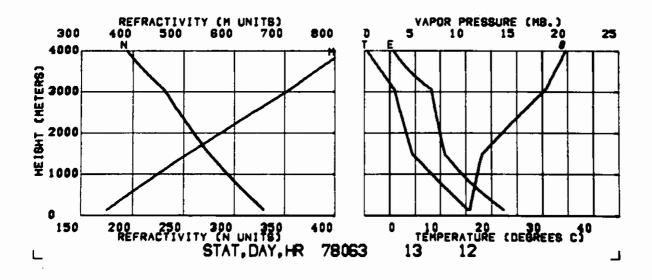


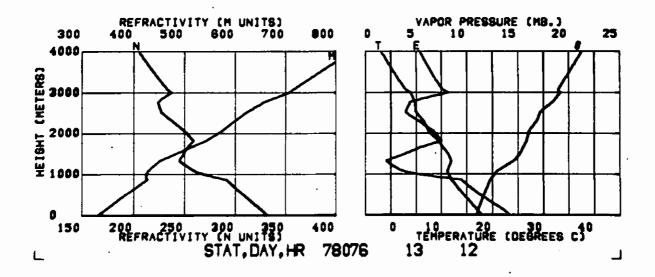


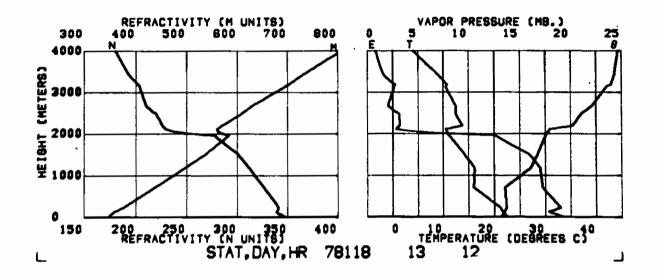


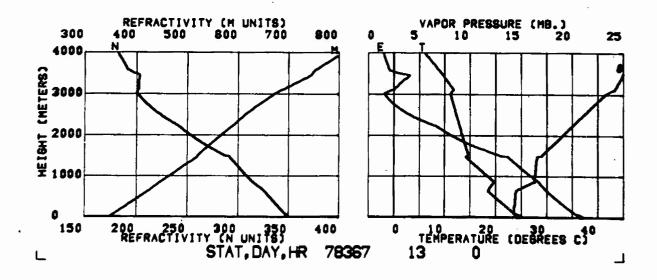


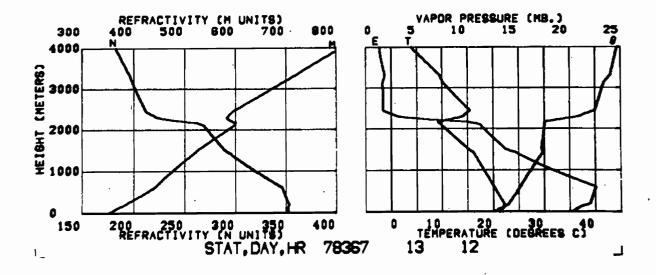


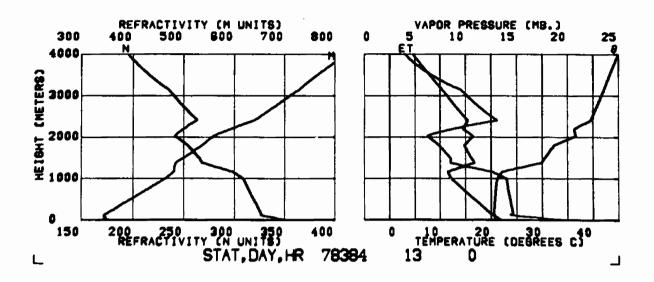


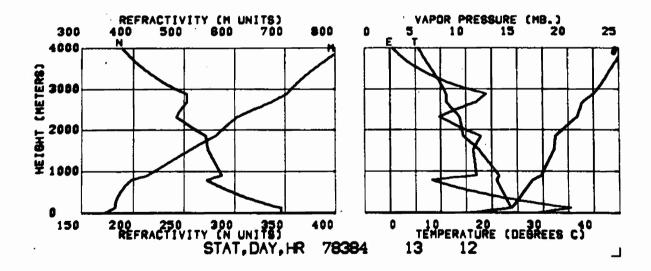


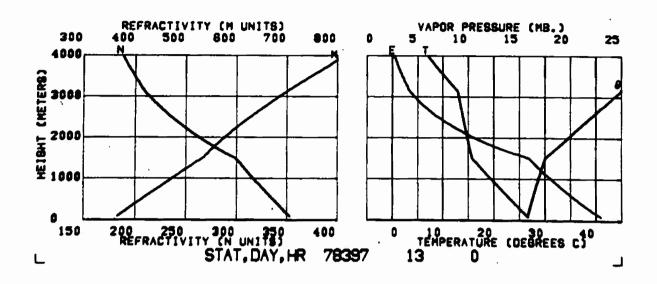


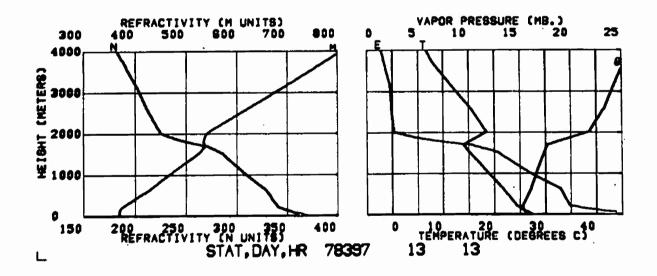


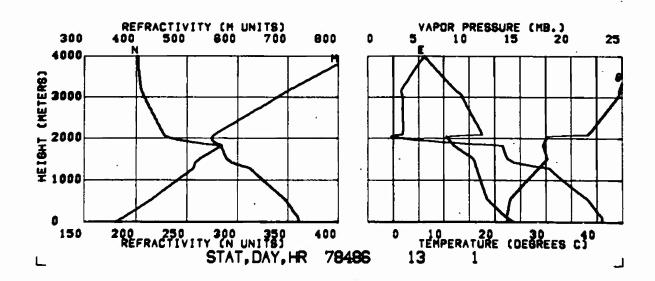


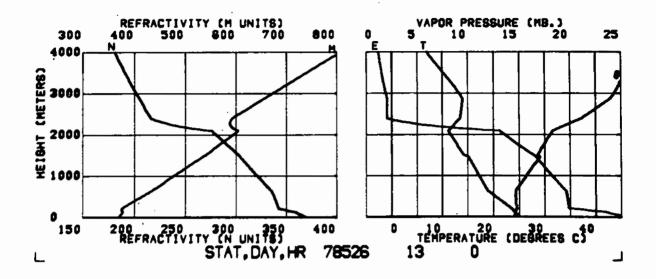


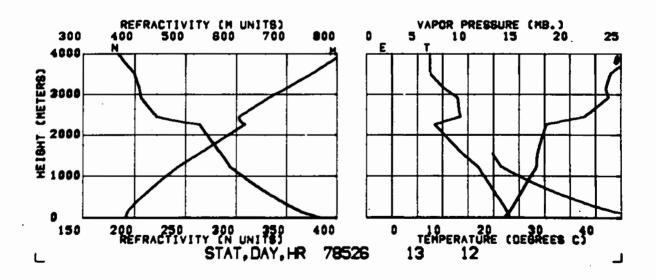


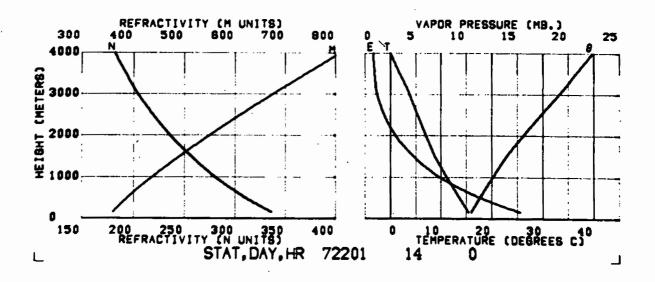


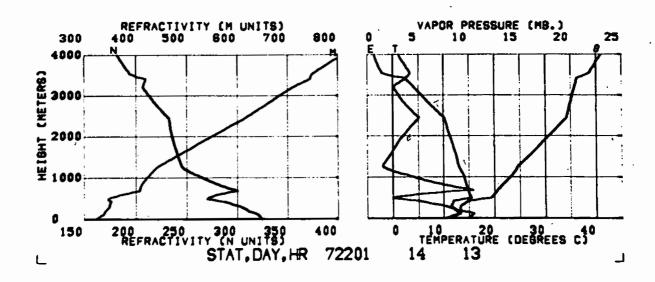


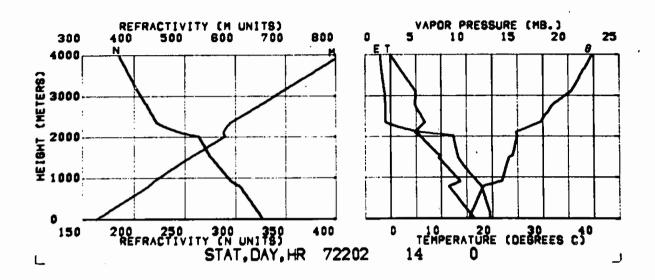


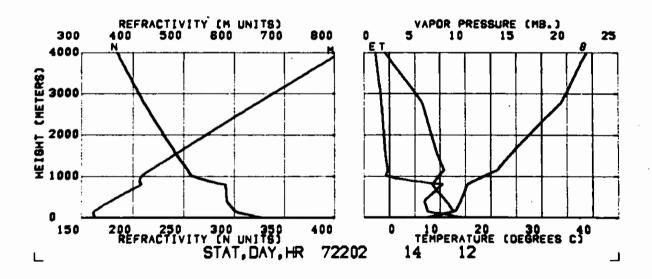


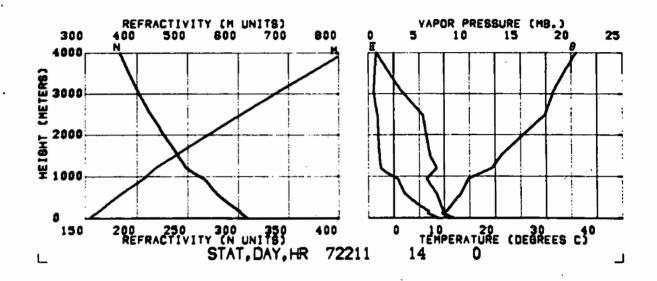


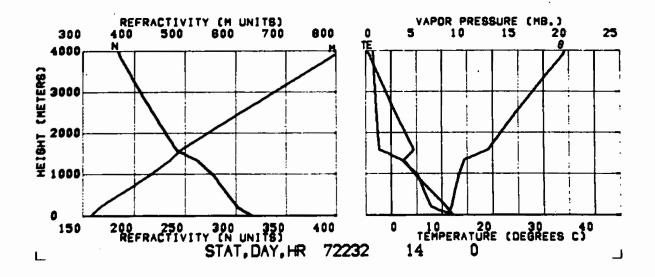


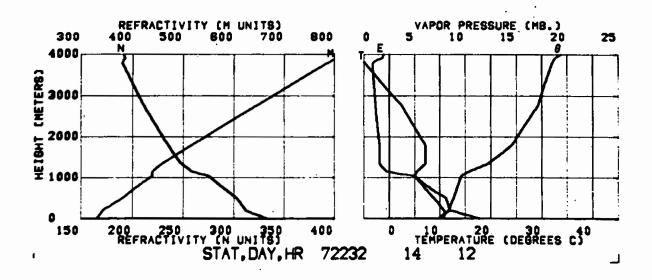


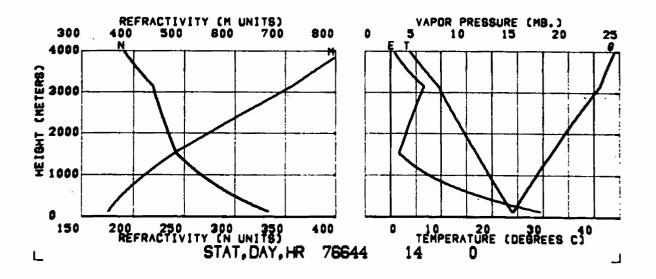


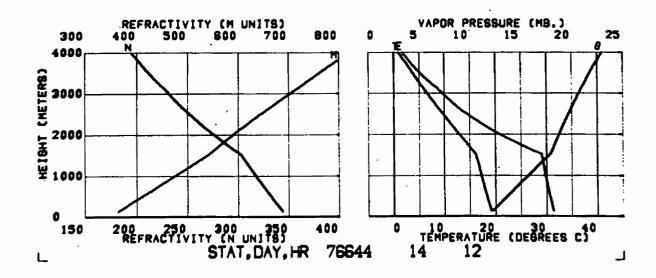


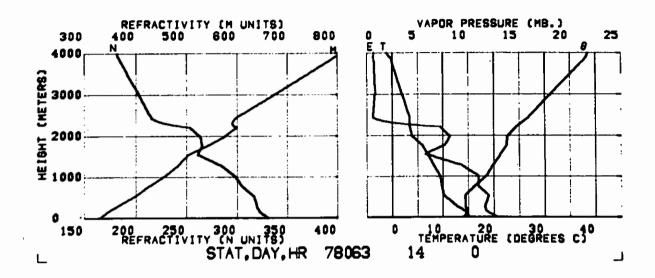


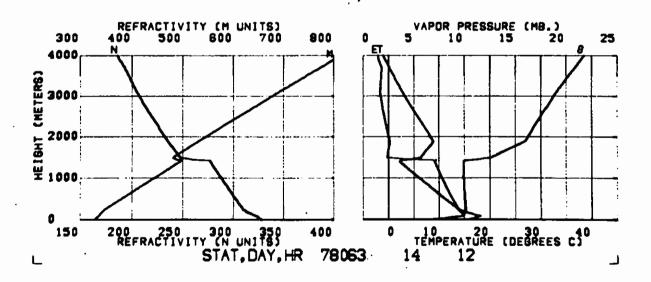


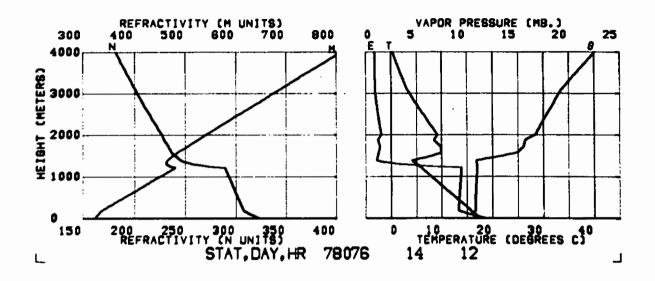


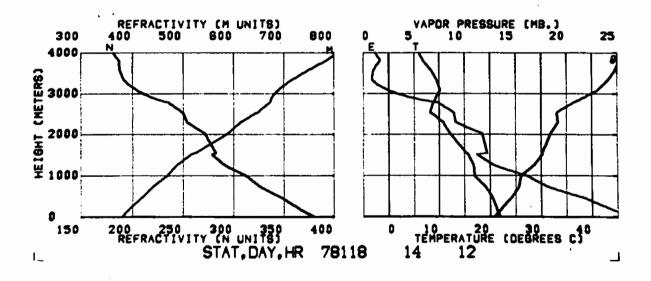


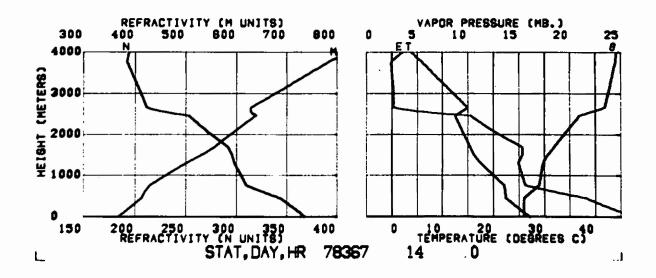


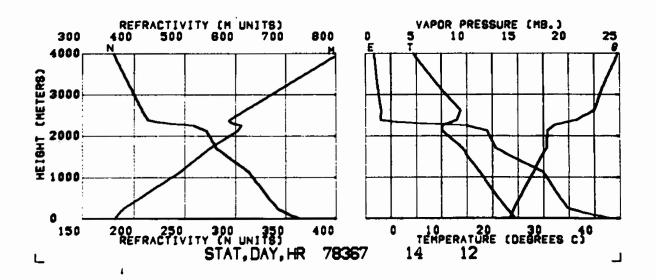


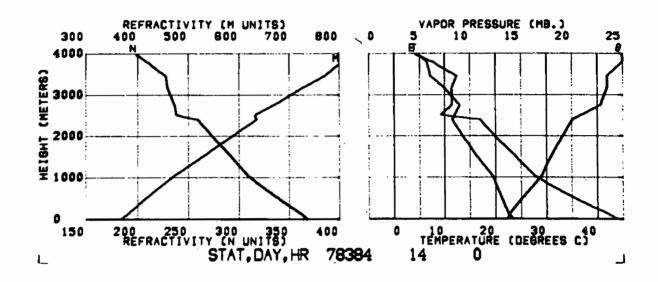


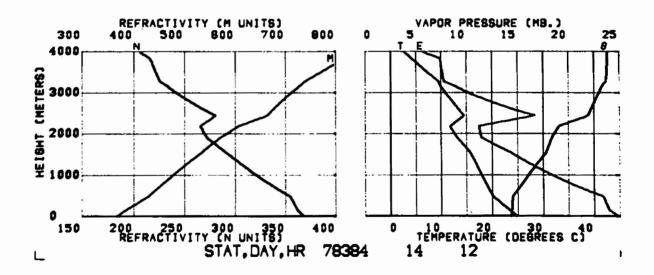


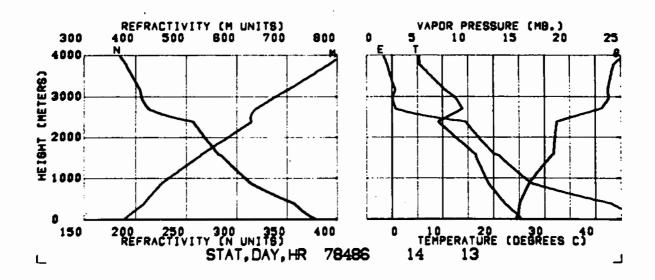


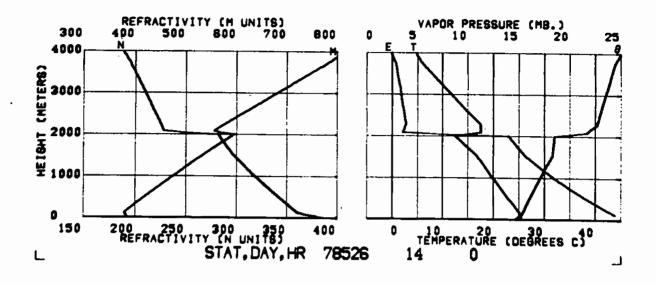


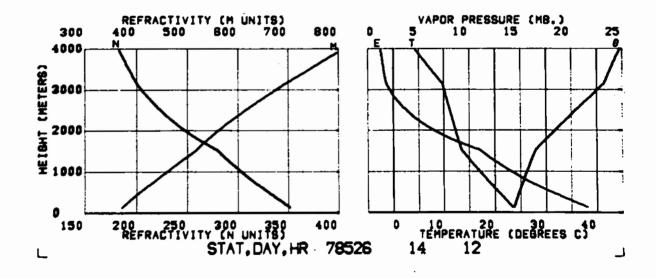


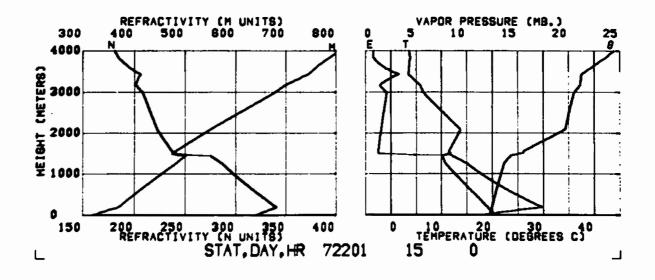


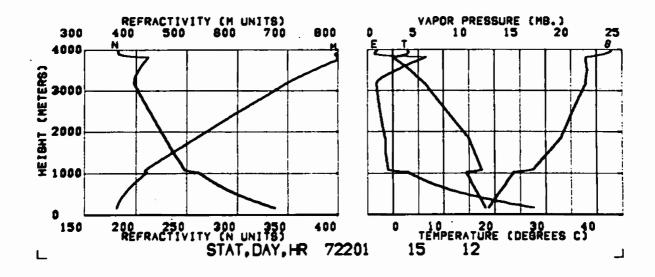


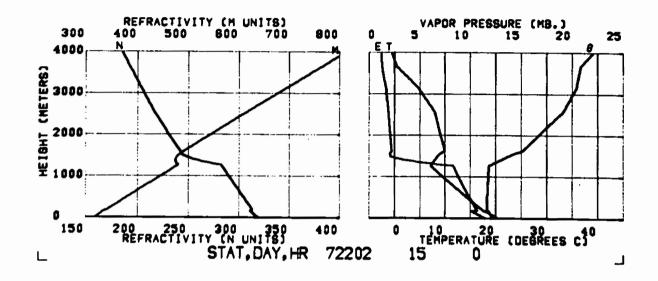


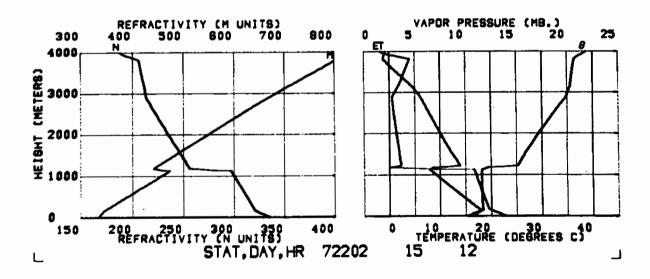


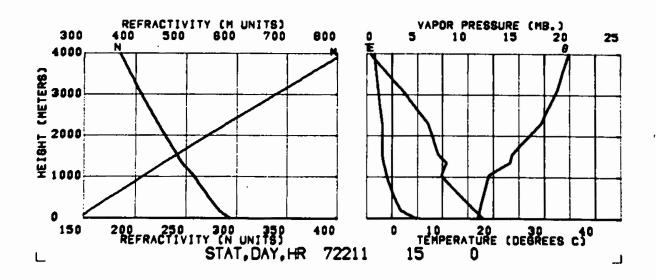


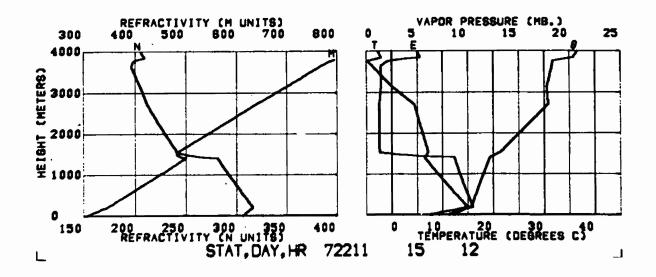


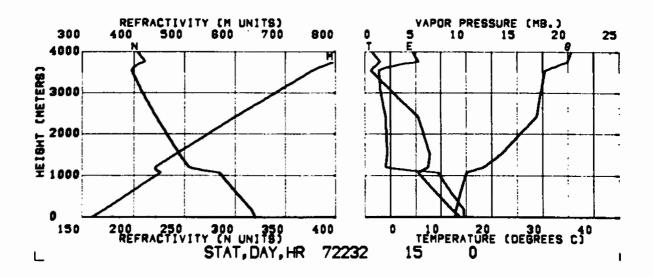


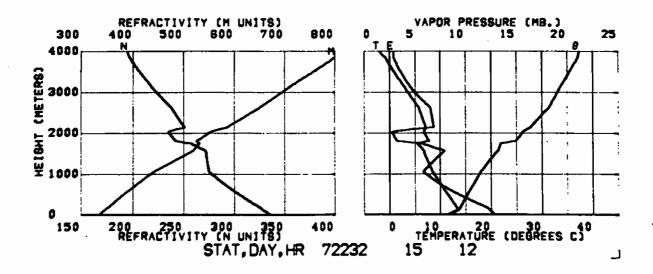


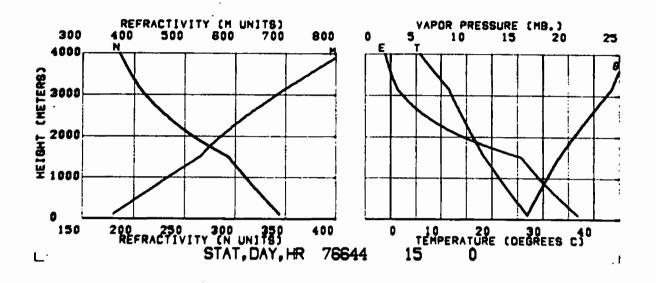


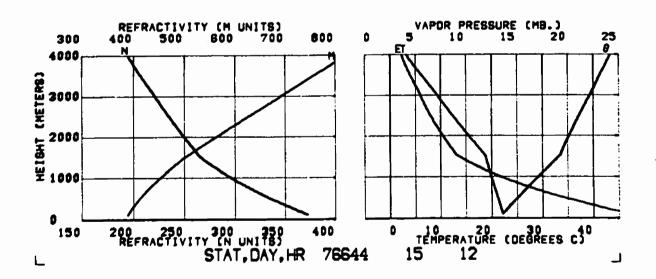


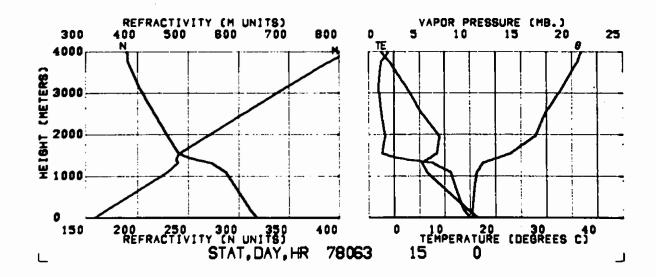


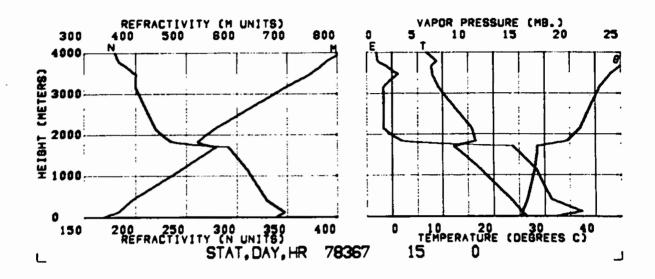


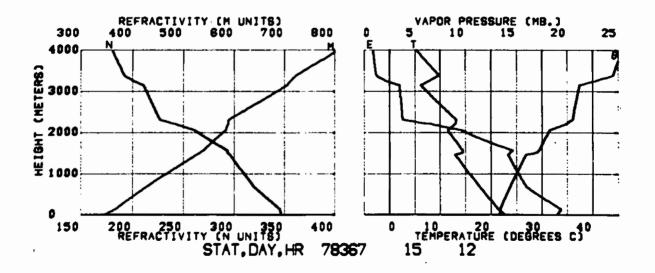


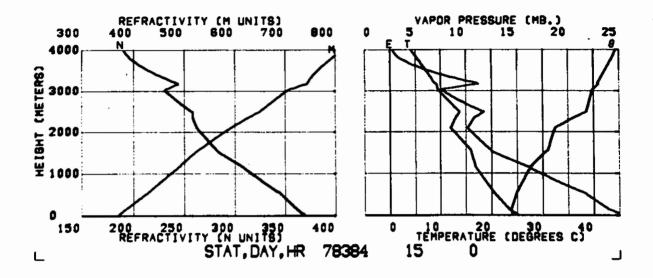


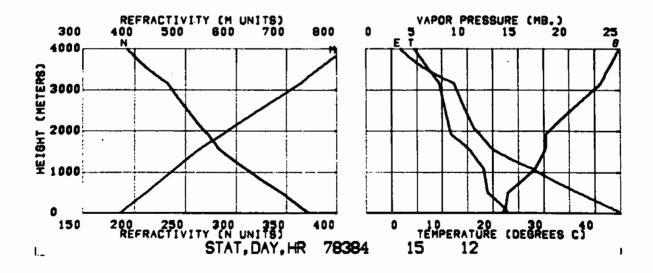


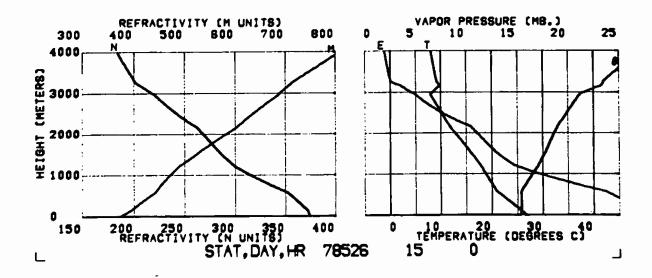


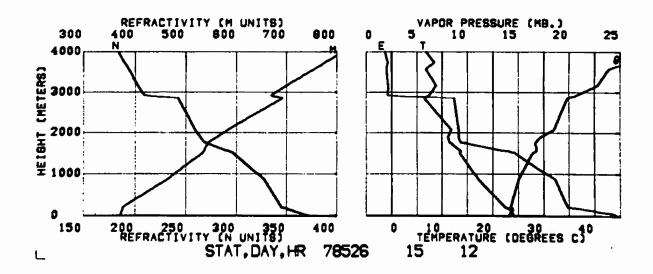


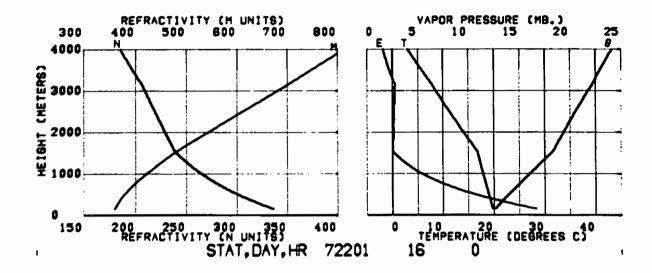


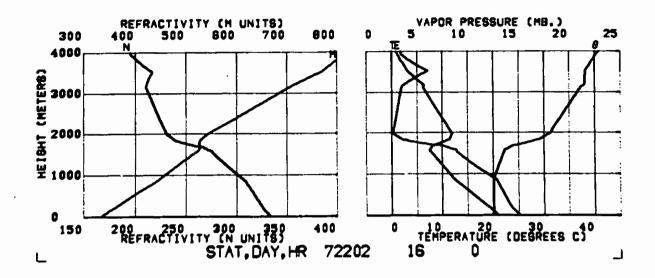


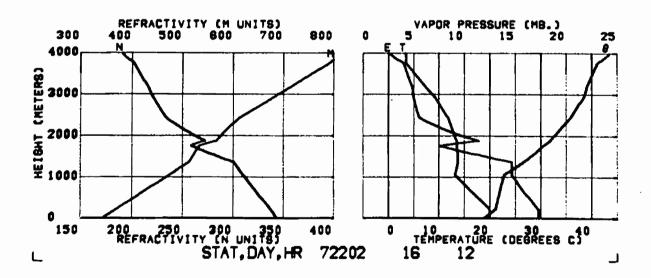


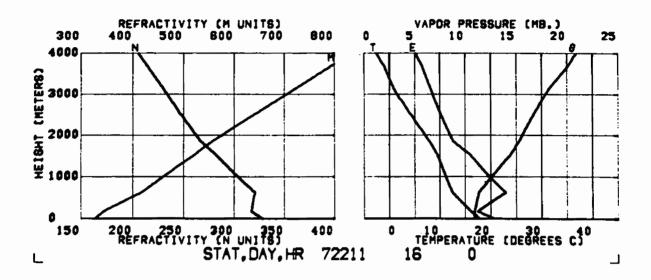


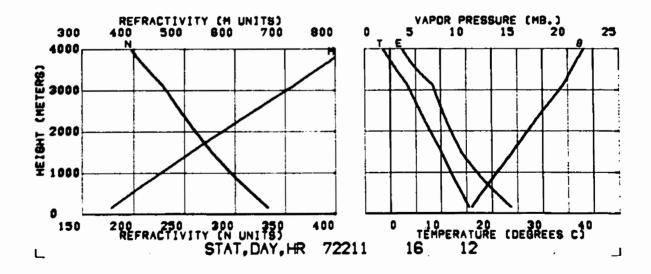


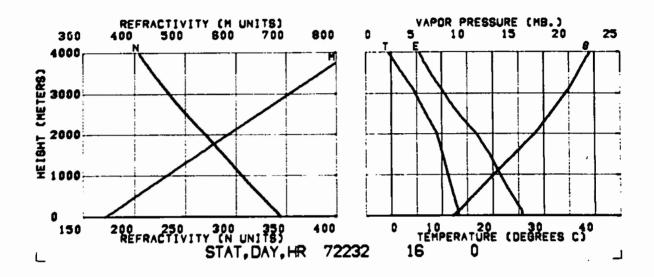


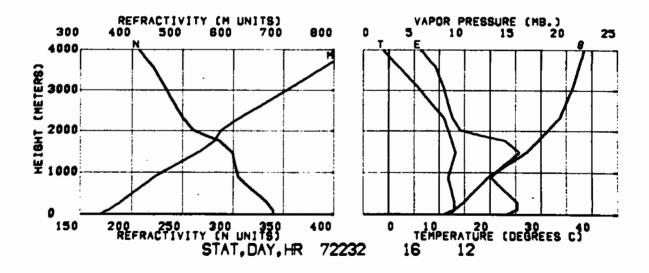


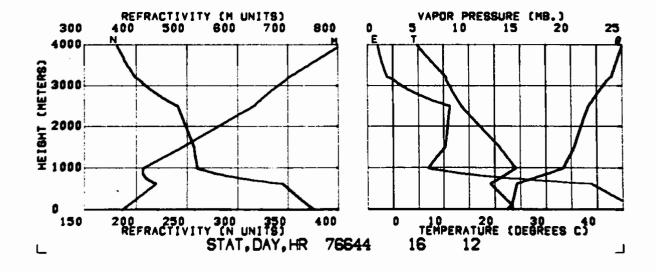


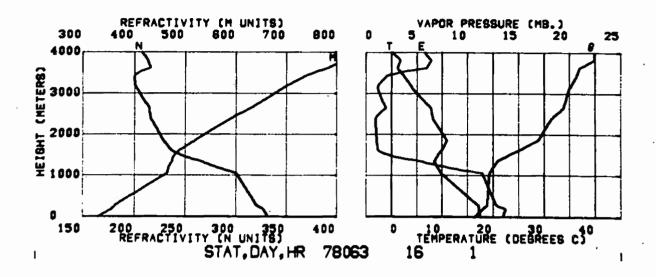


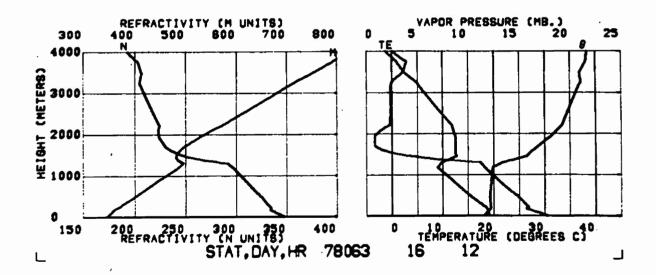


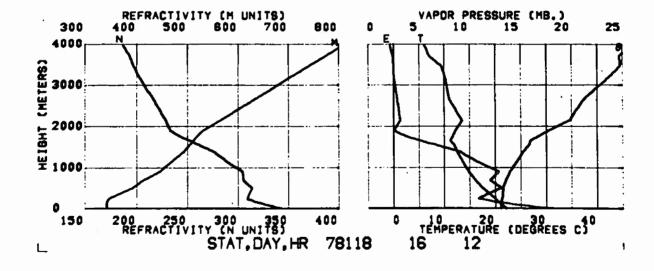


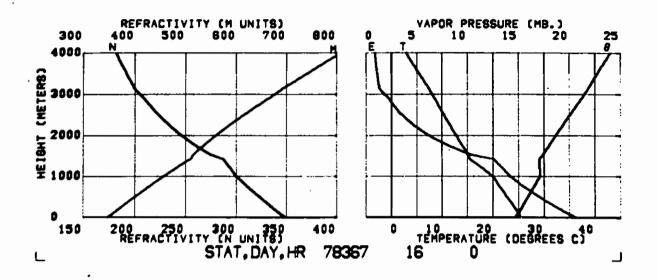


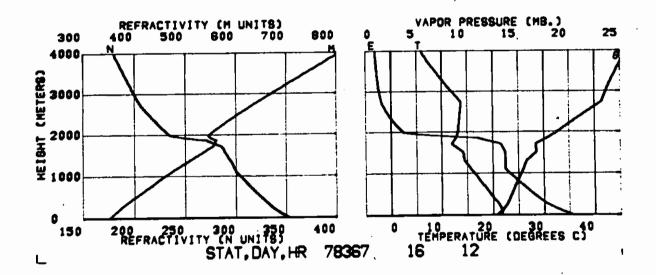


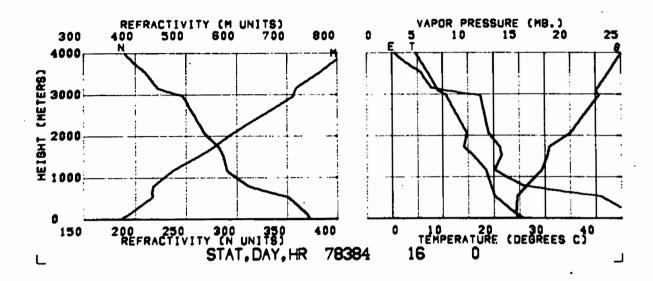


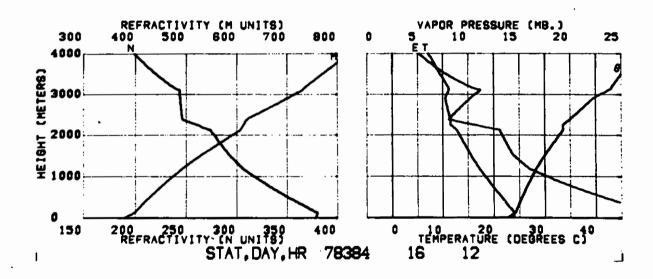


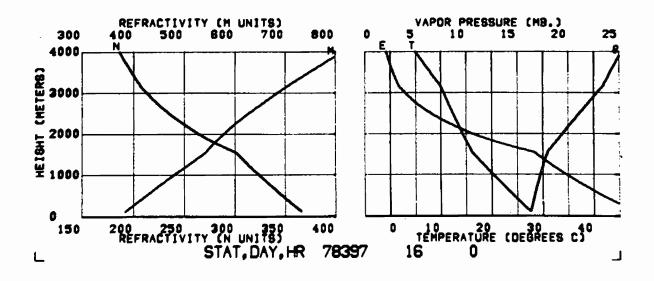


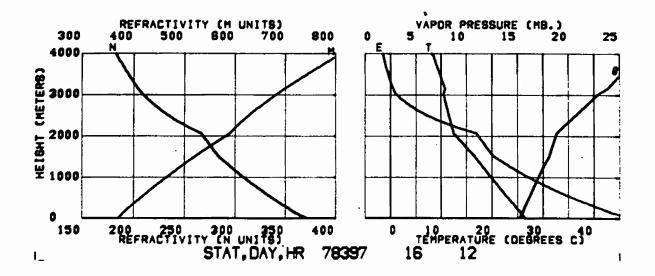


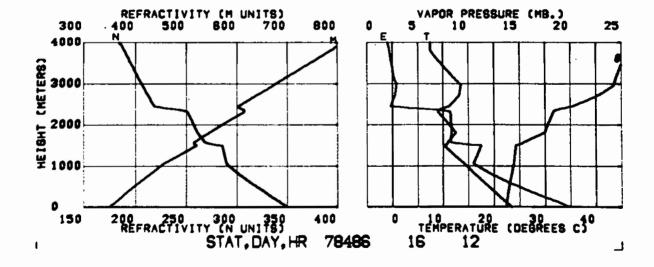


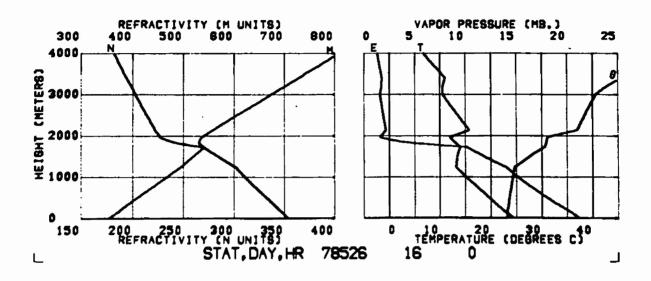


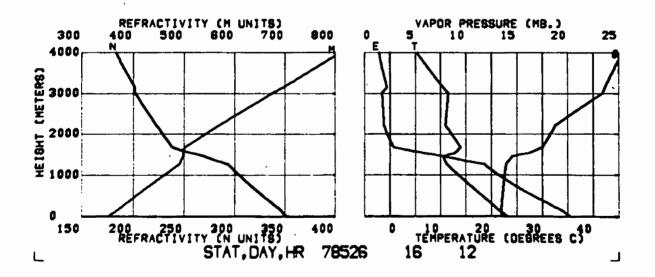


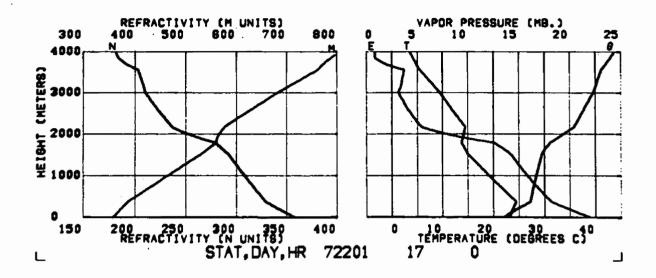


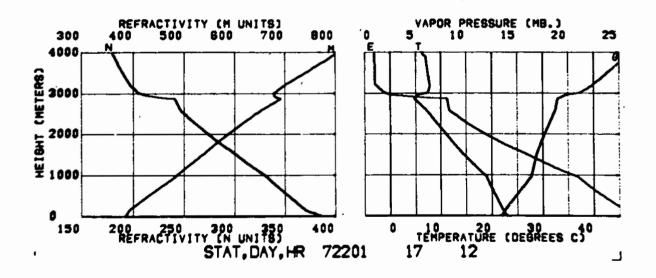


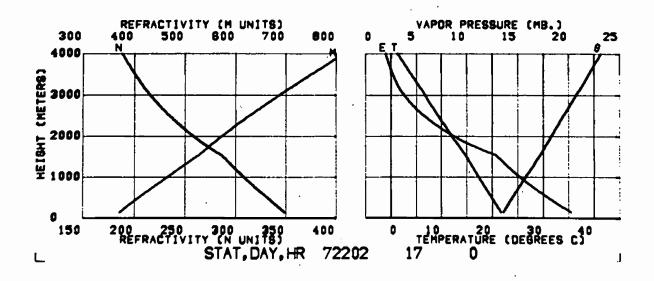


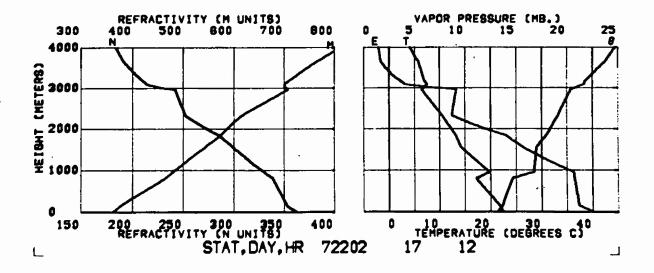


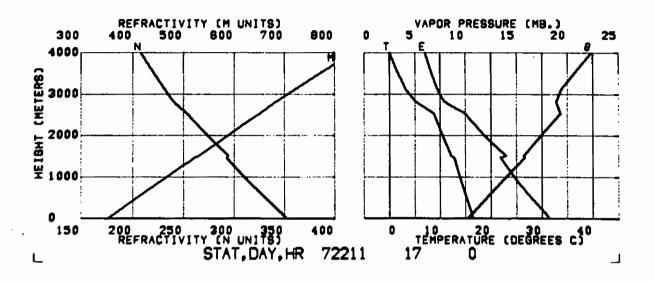


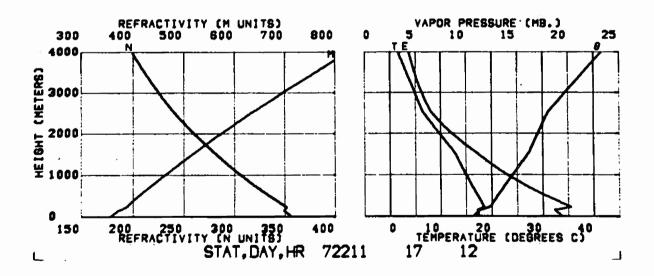


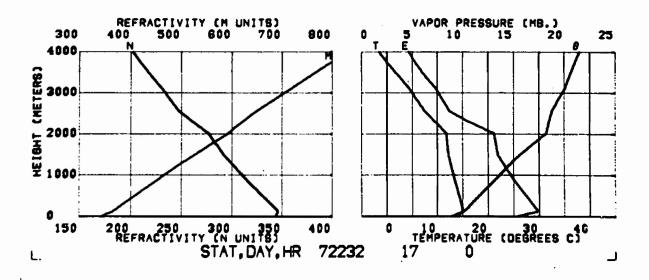


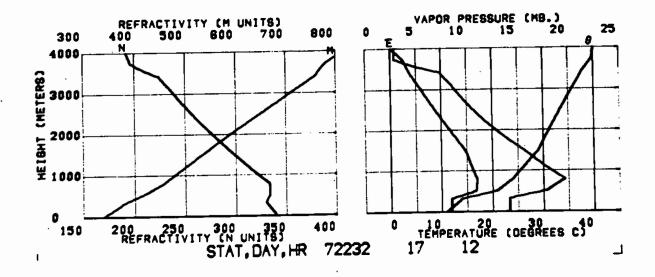


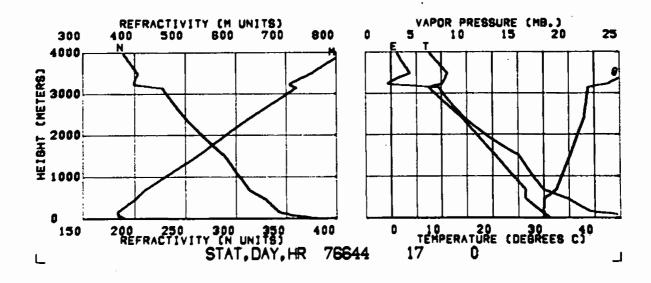


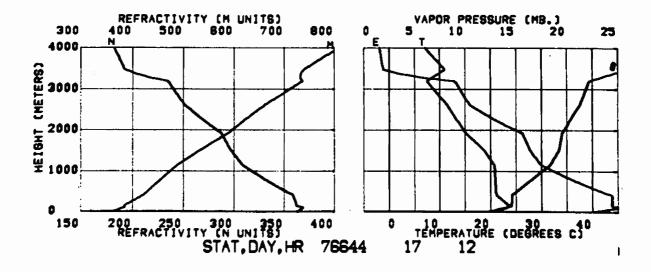


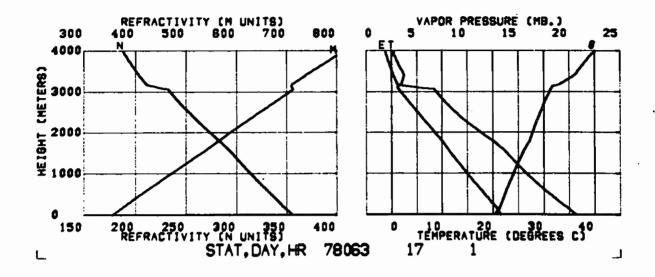


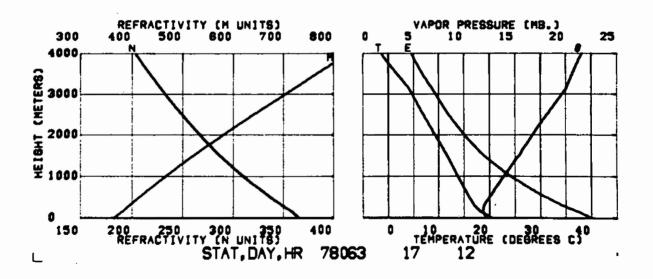


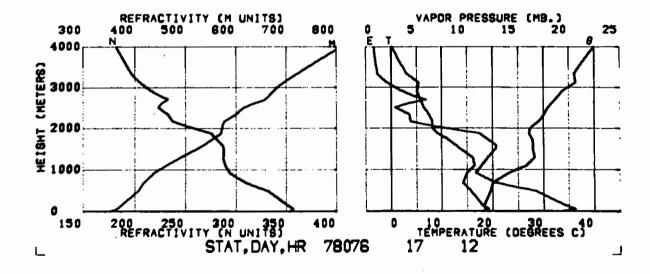


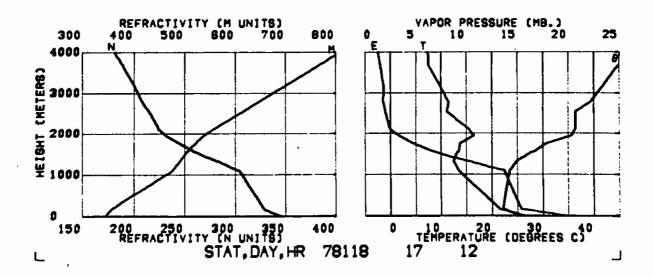


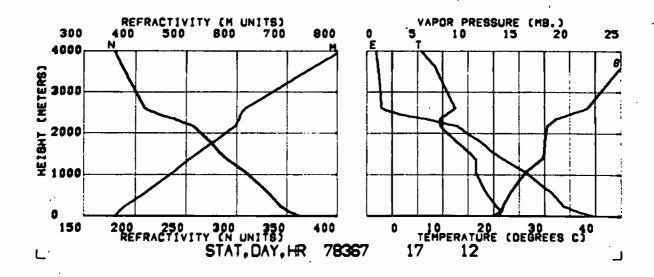


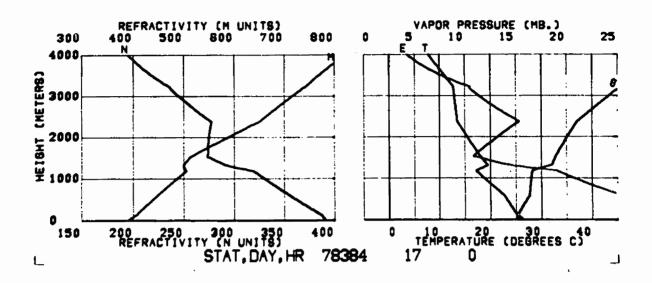


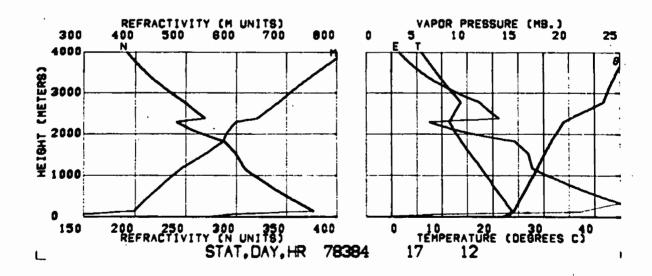


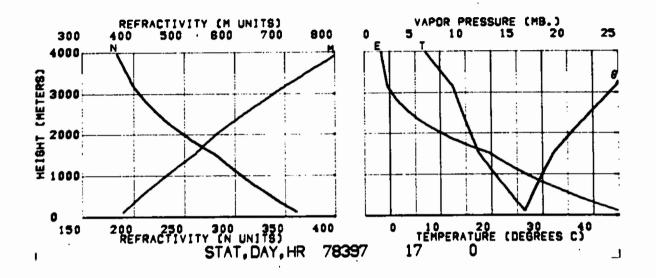


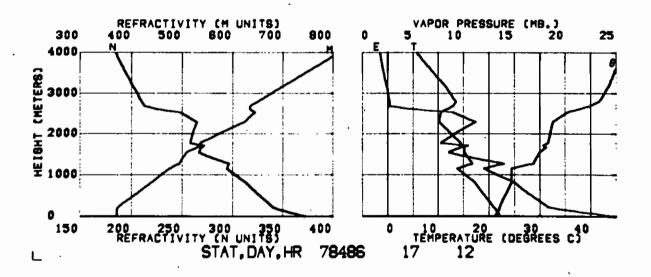


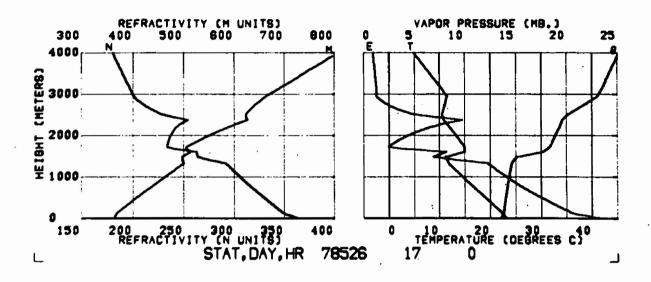


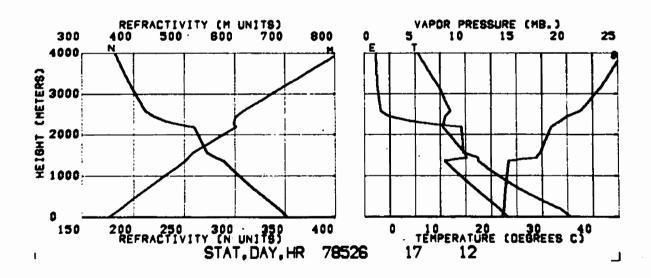


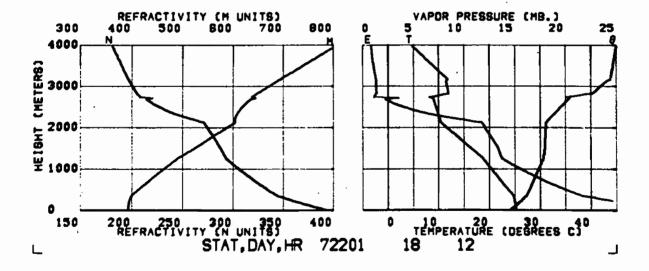


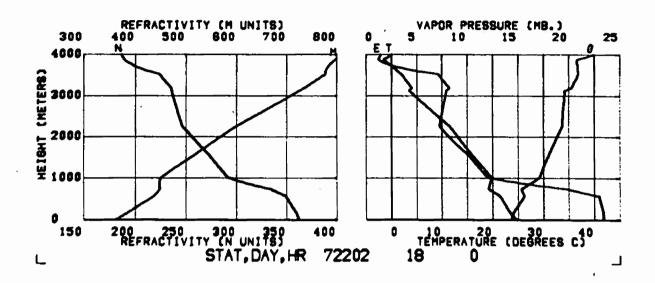


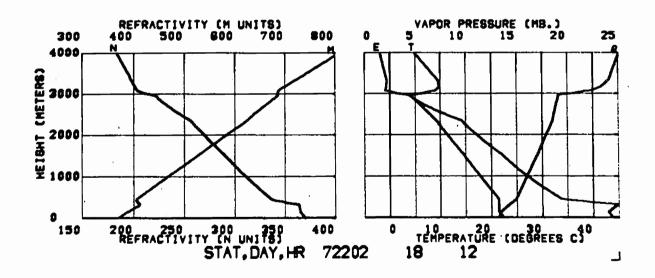


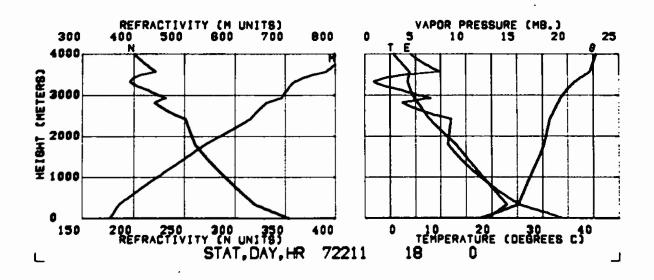


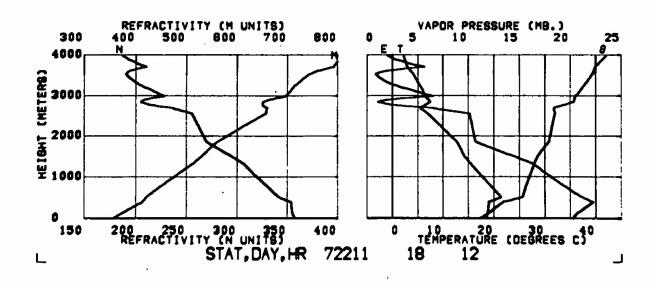


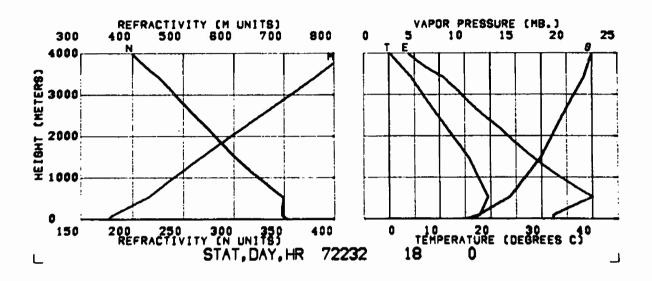


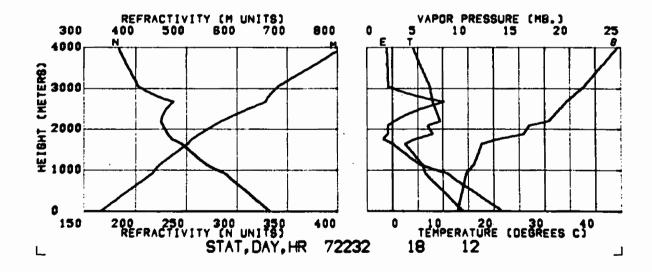


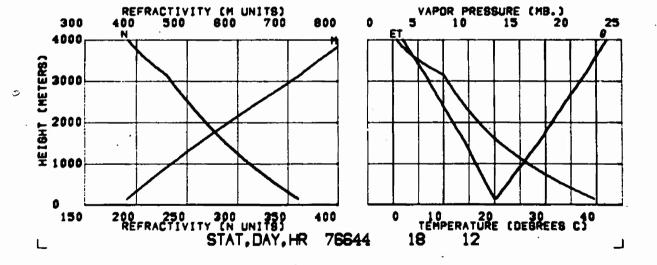


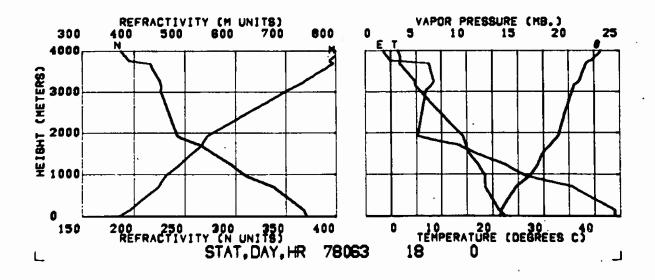


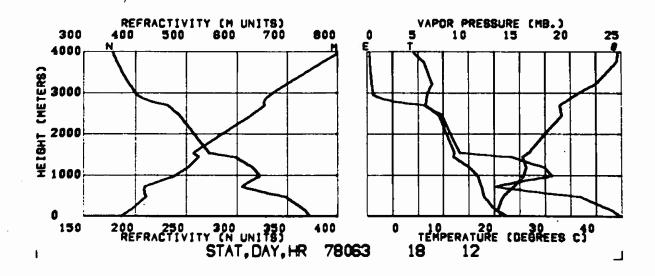


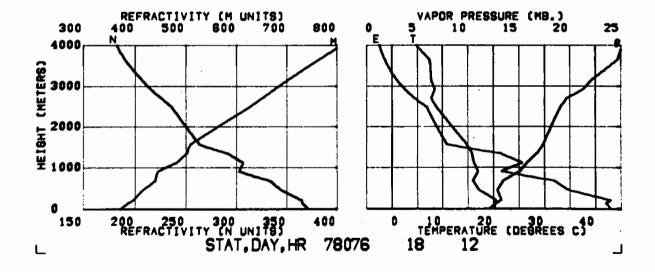


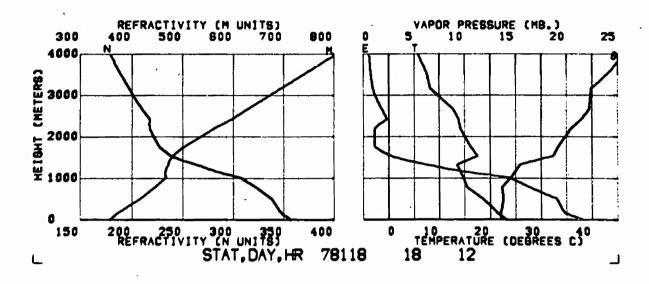




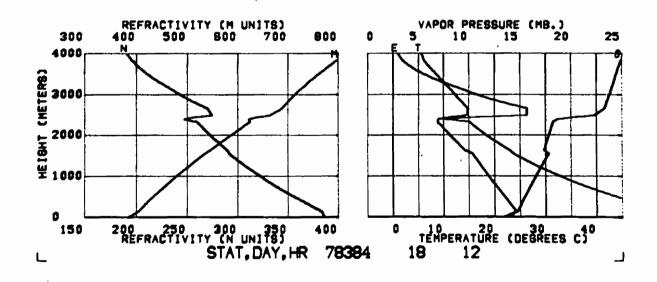


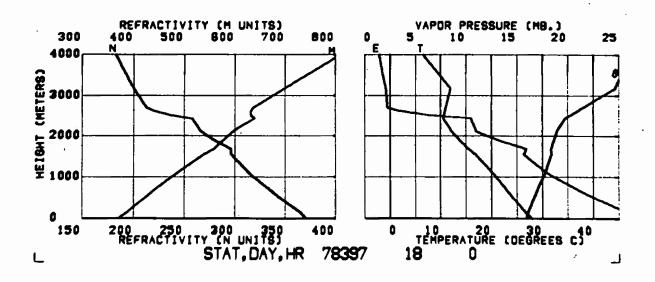


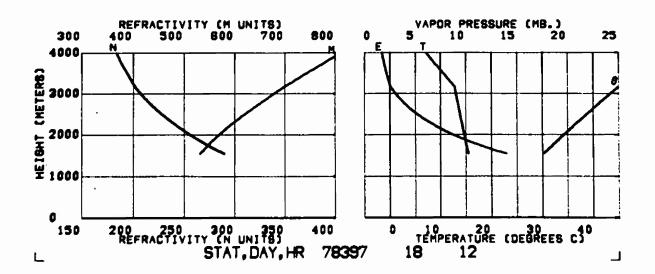


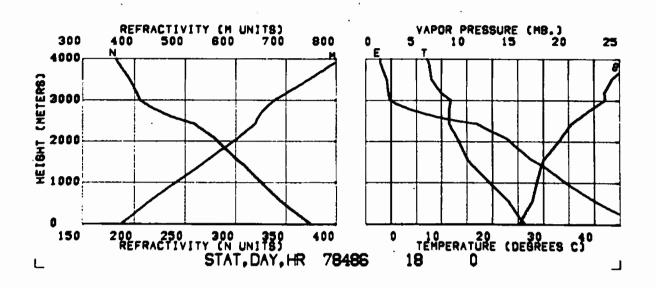


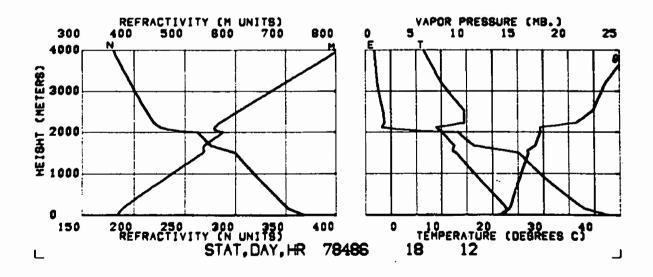
Ç

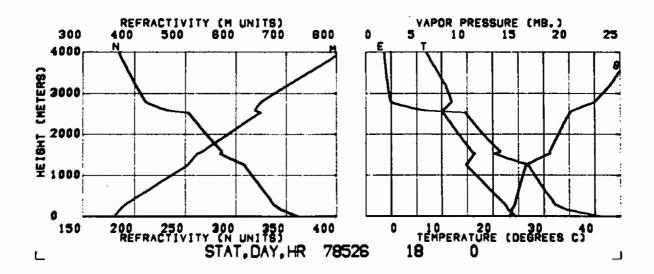




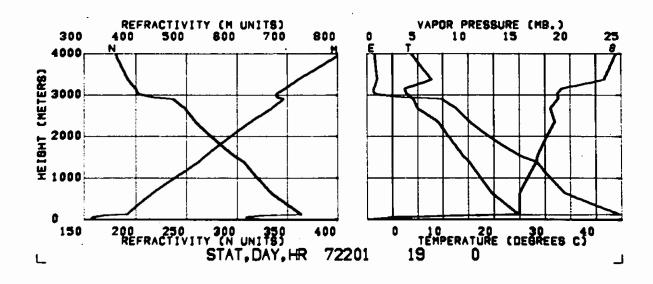


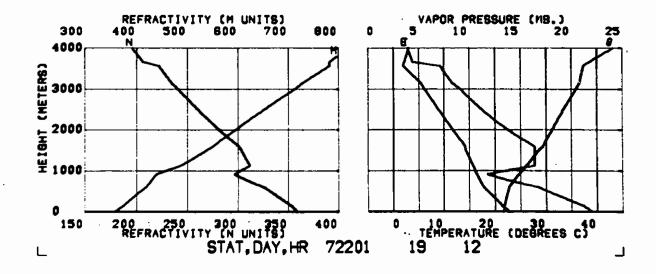


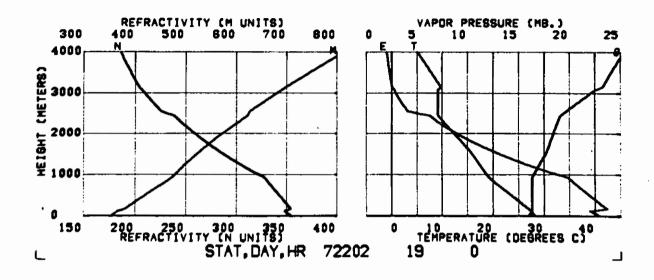


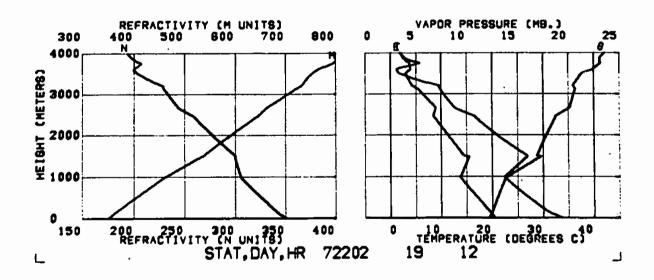


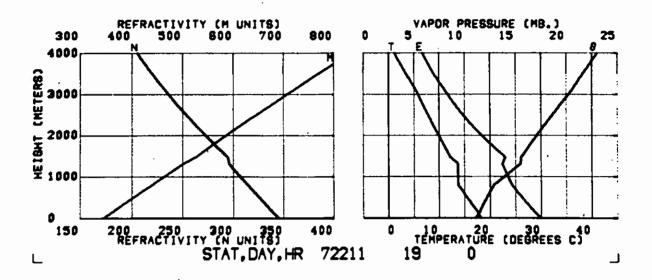
زم

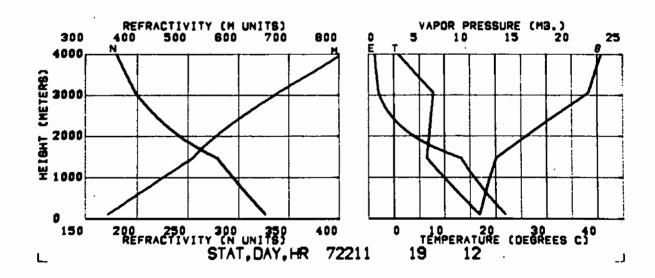


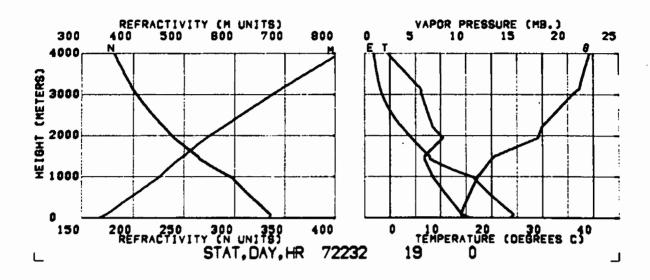


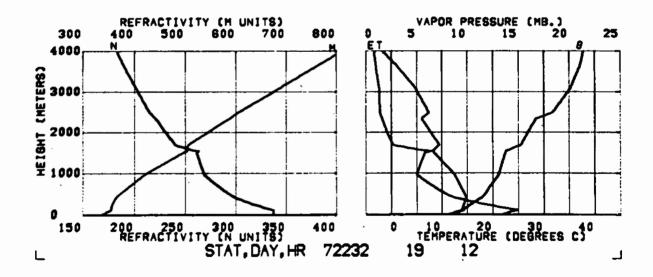


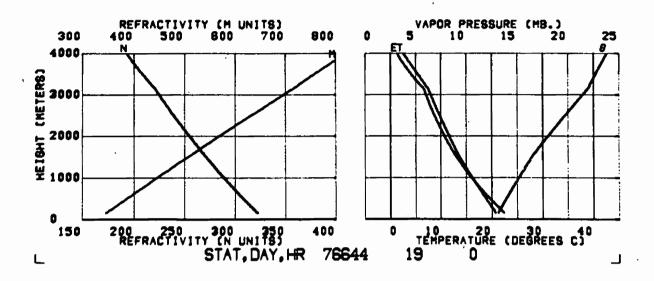


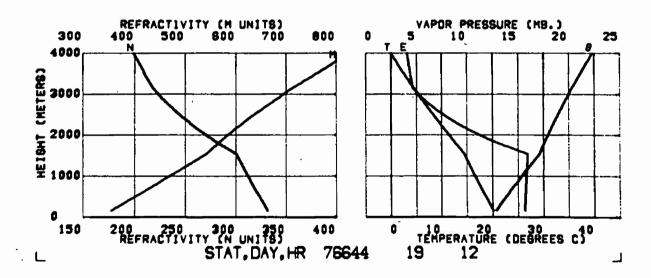


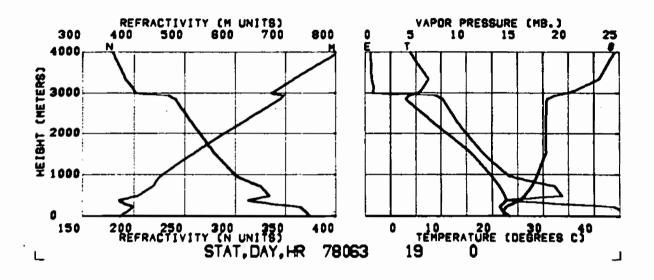


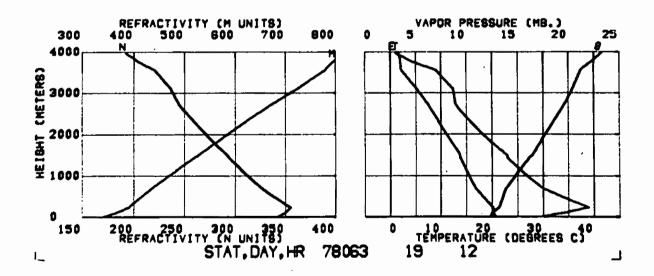


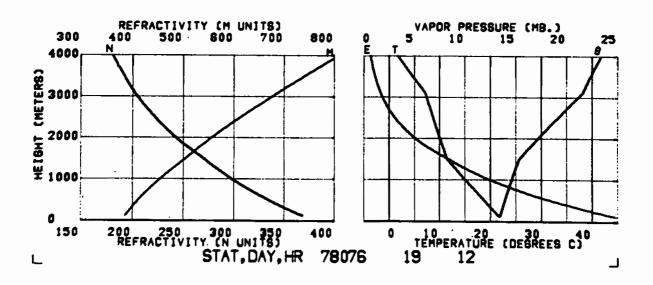


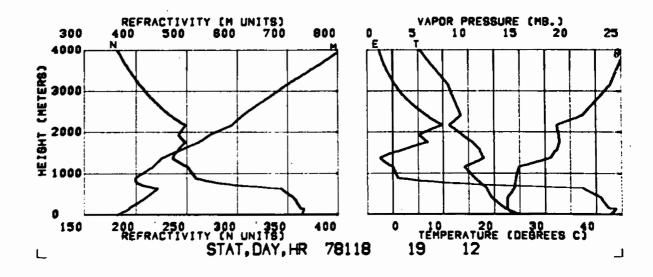


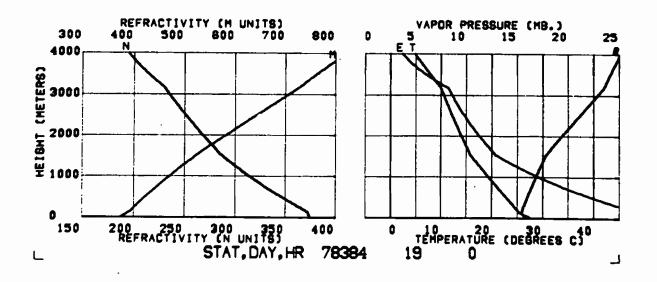




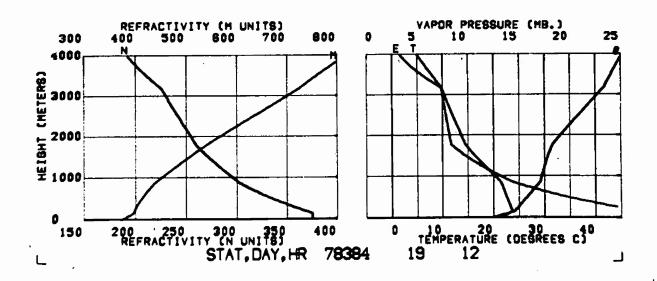


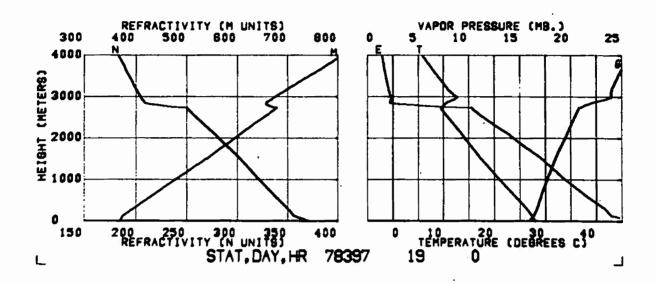


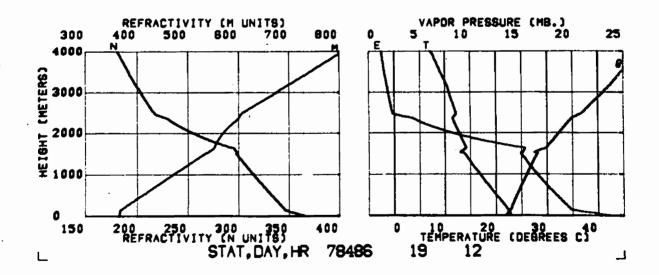


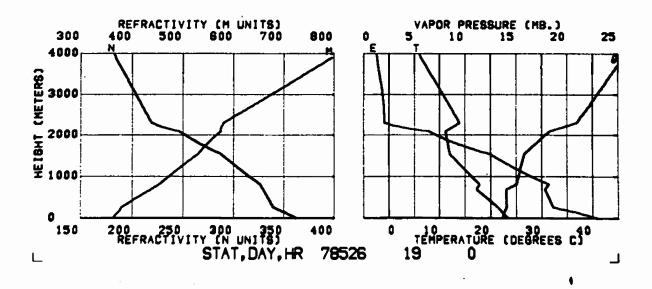


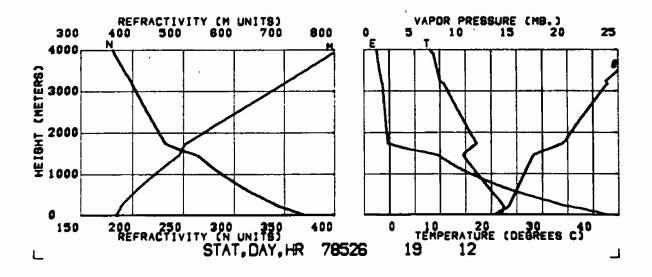
*

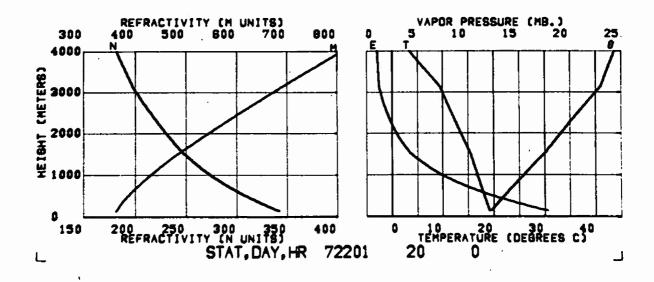


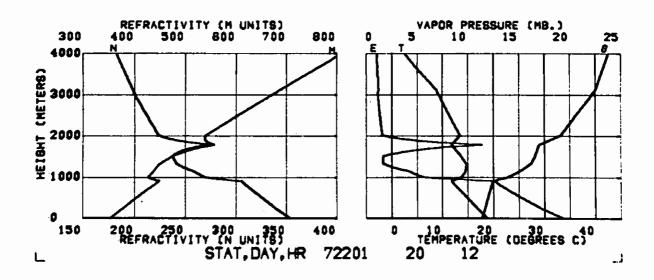


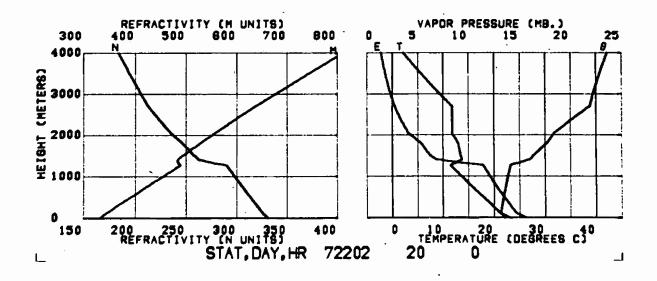


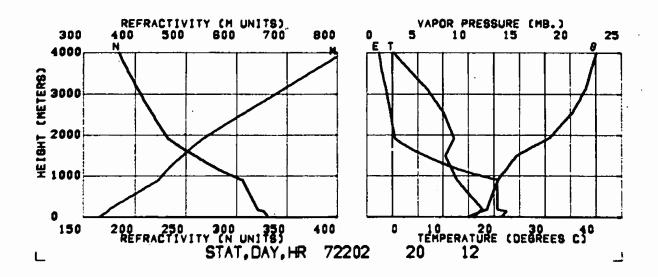


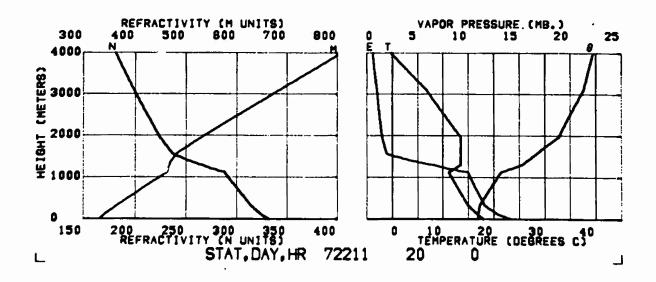


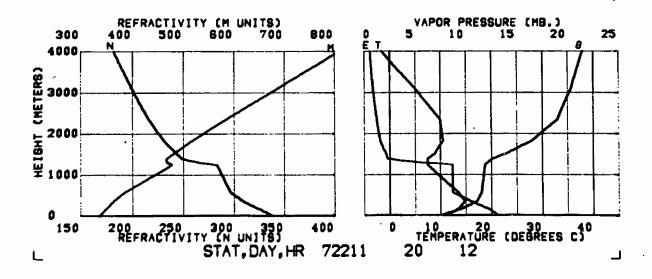


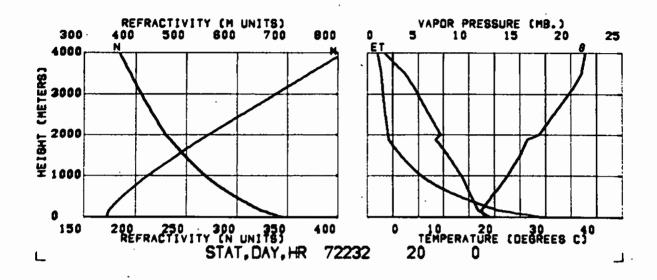


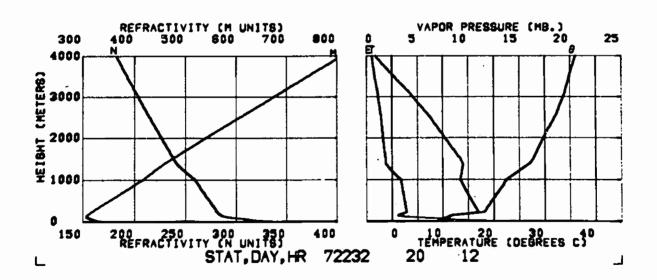


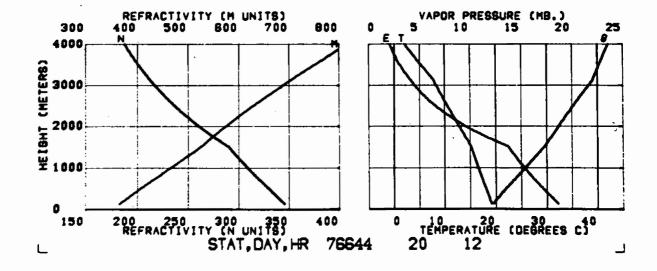


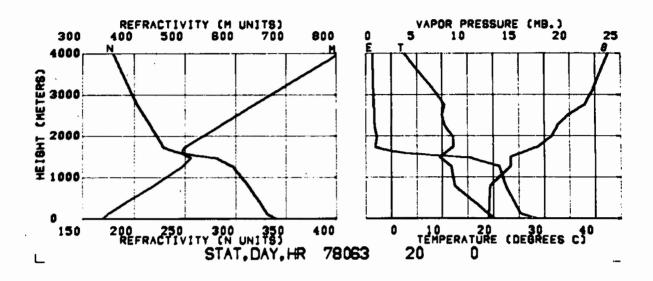


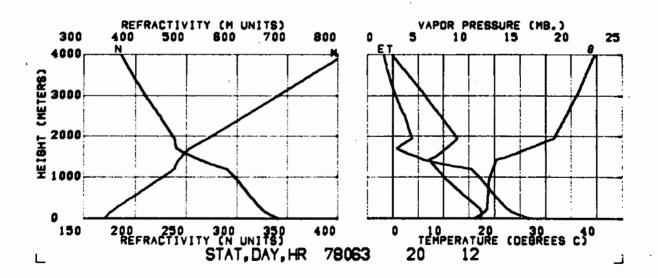


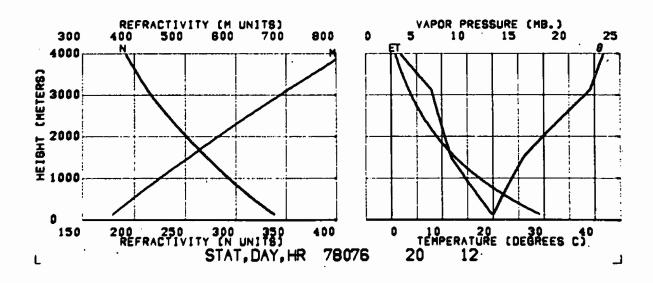


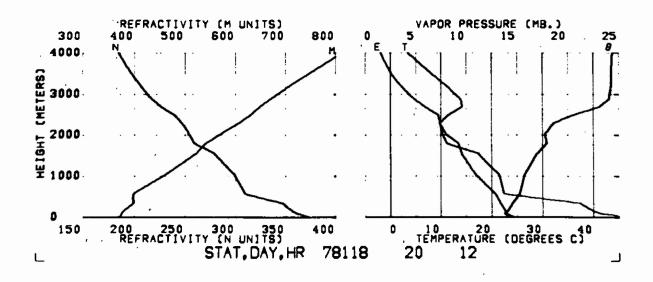


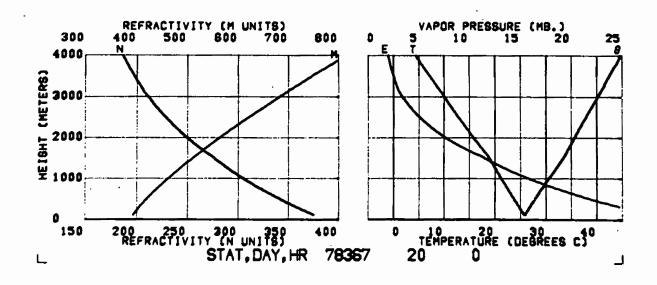


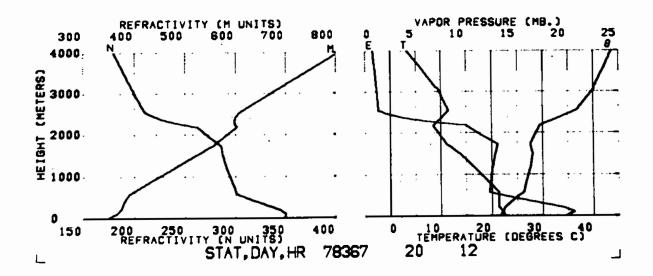


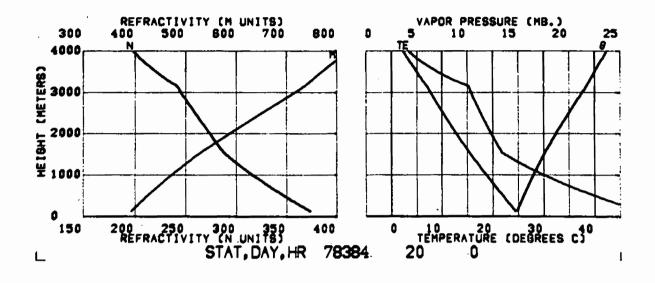


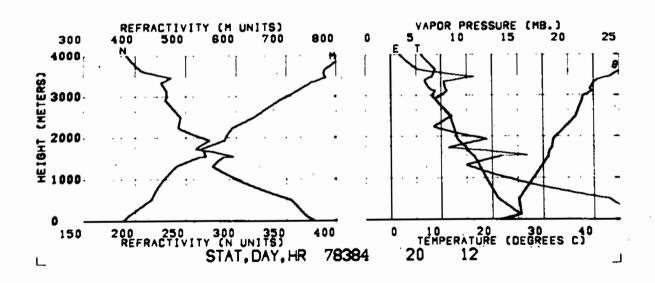


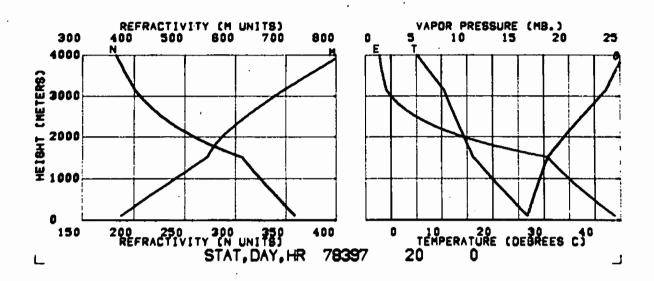


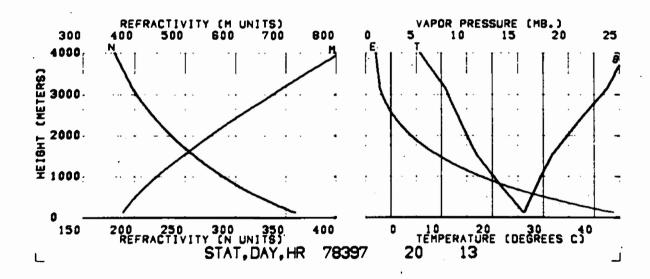


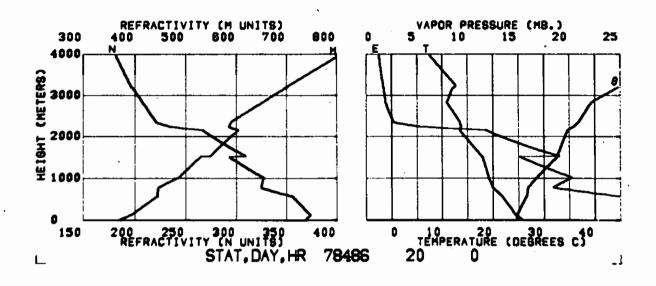


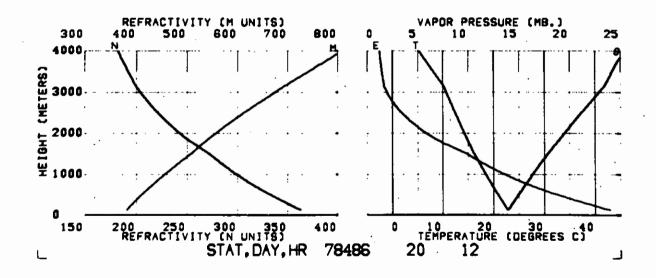


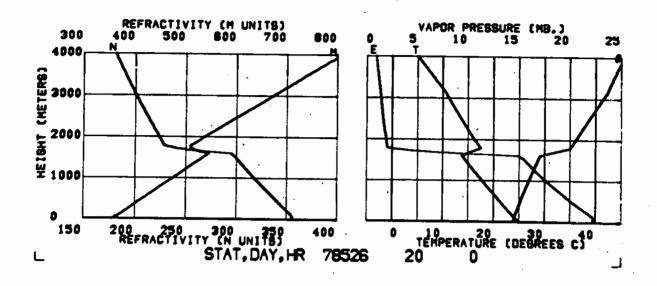


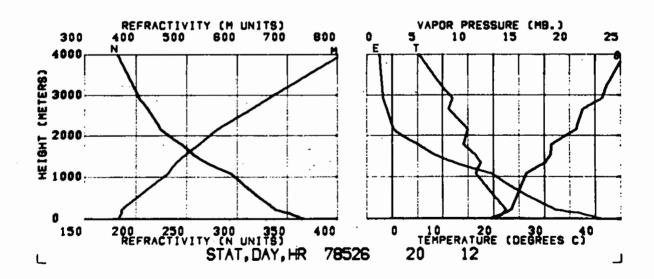


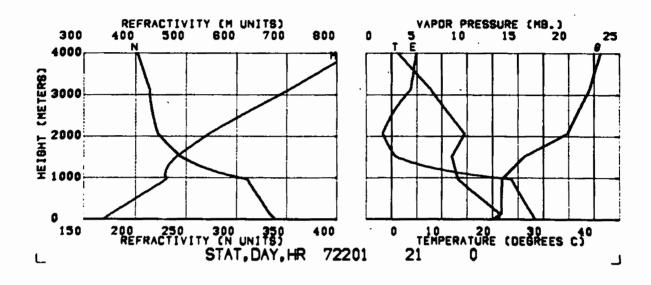




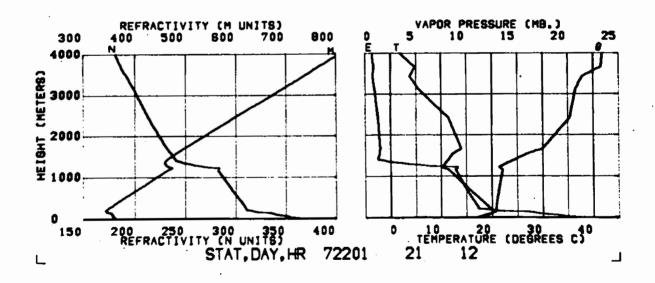


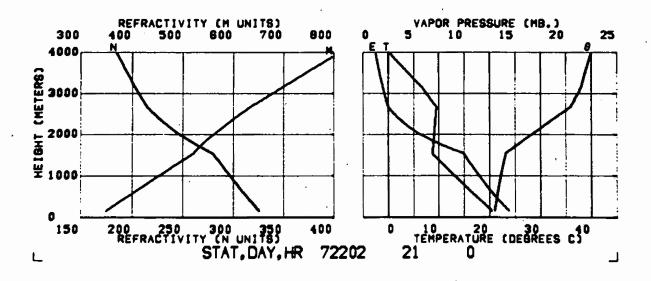


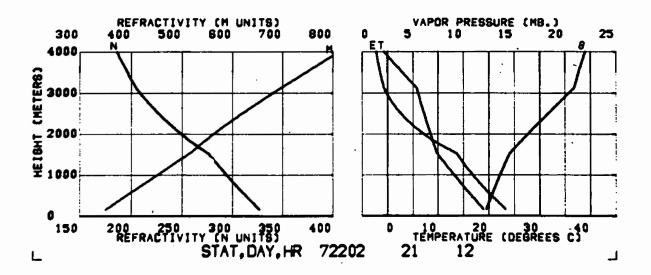


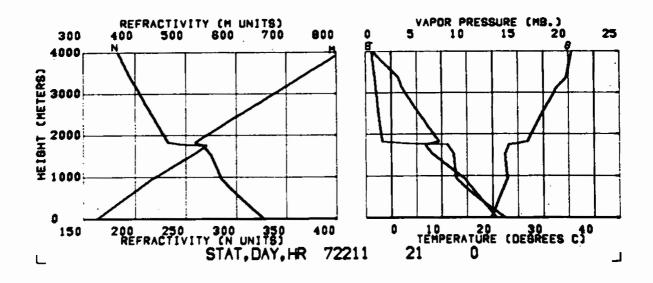


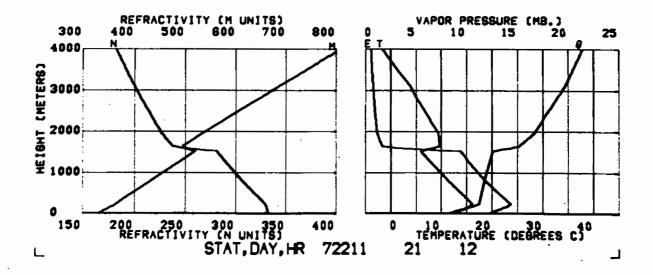
چکسر

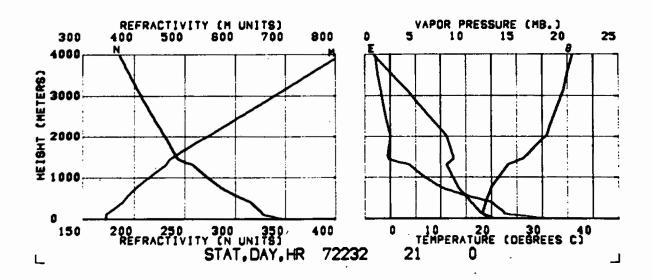


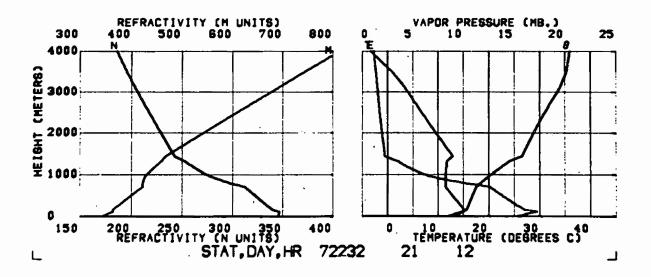


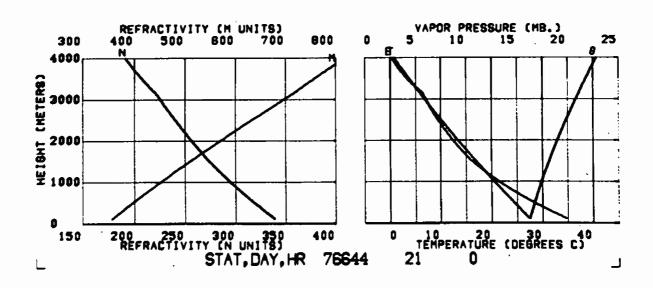


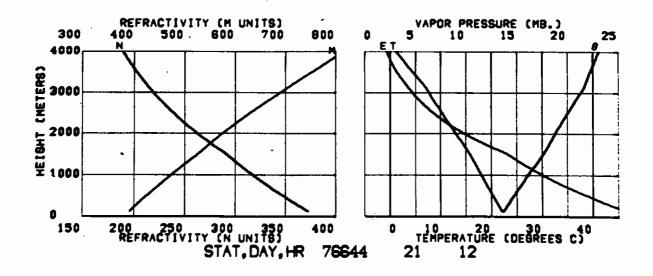


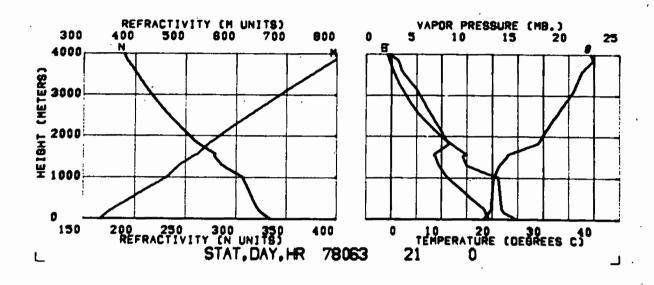


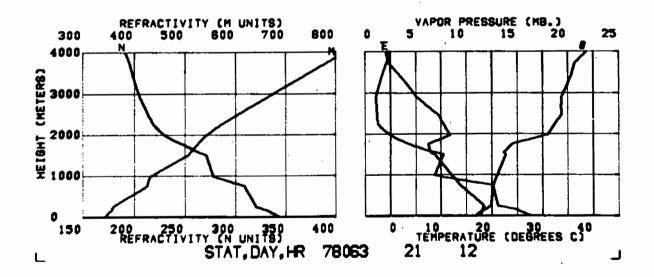


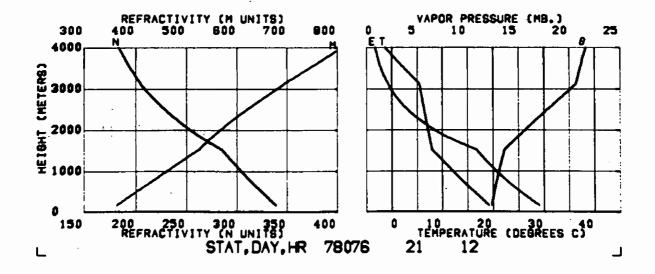


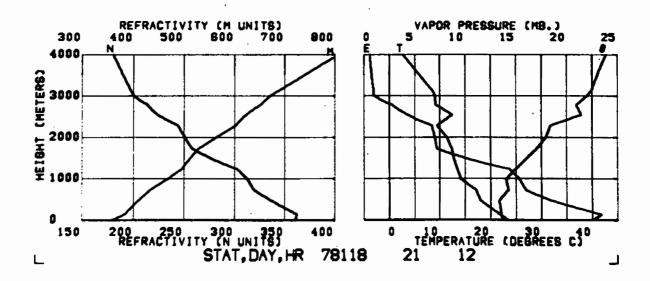


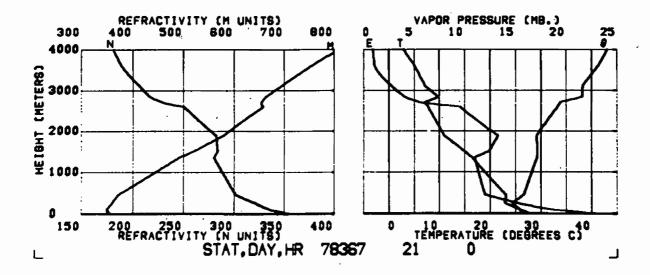




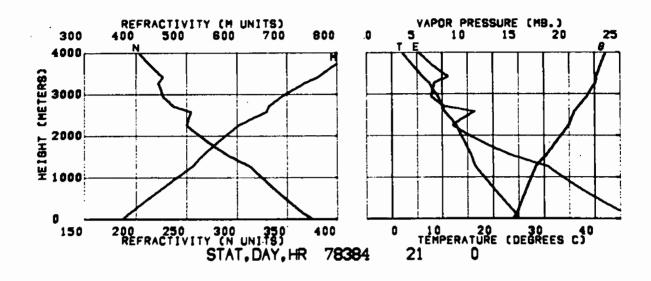


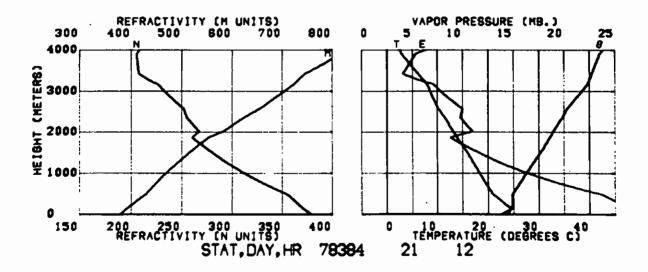




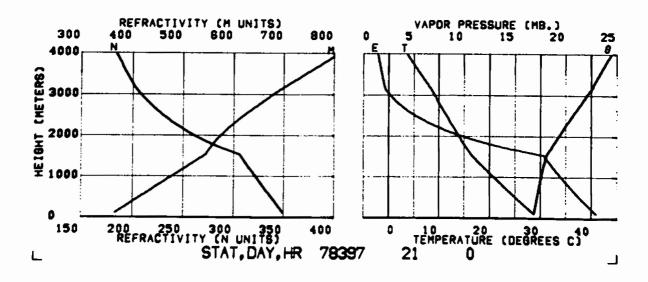


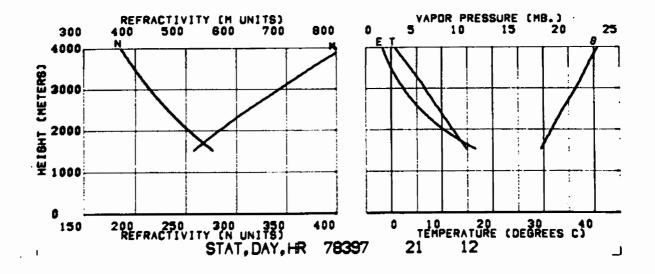
ţ.,

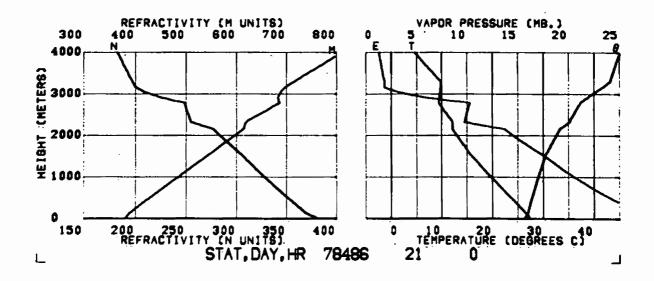


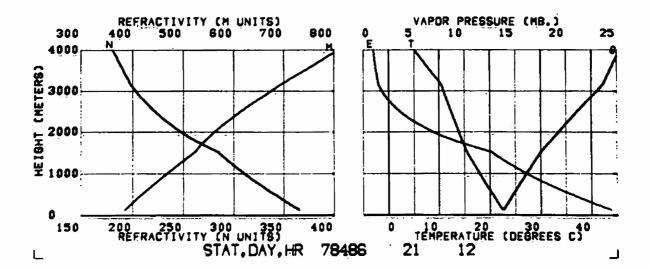


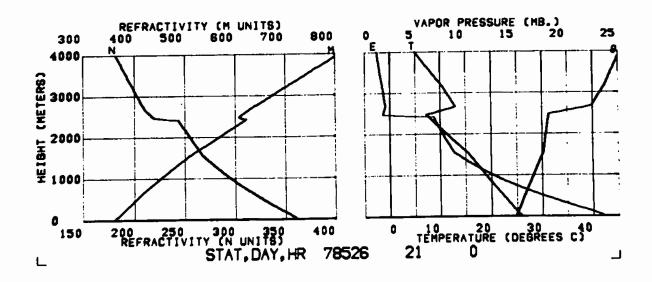
#

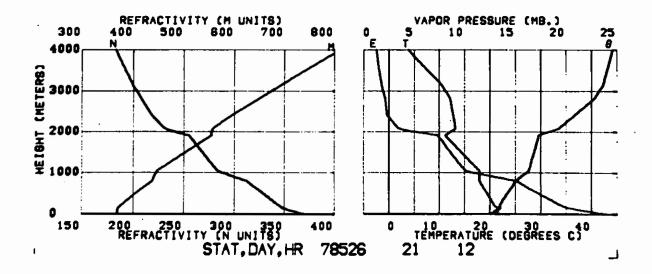


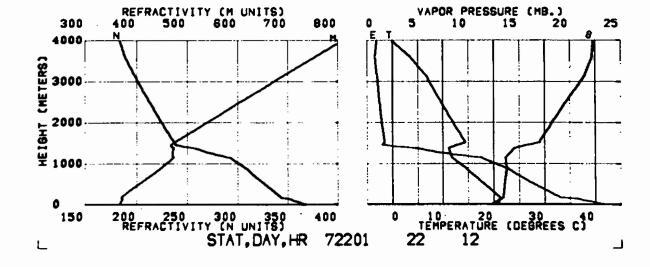


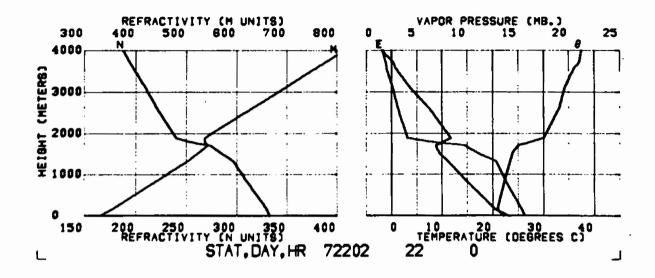


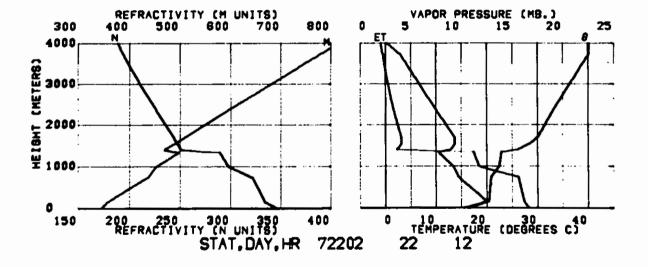




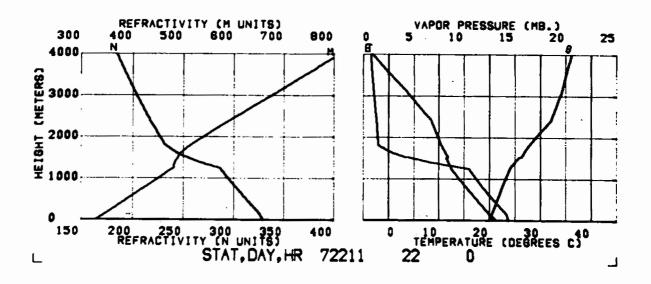


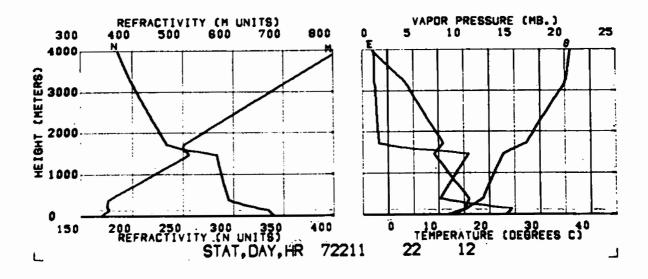




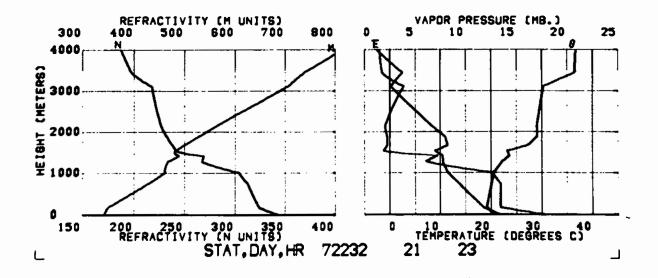


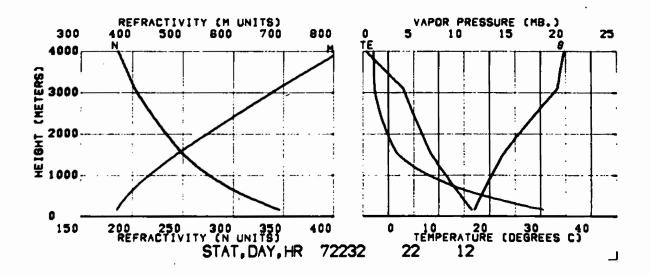
()

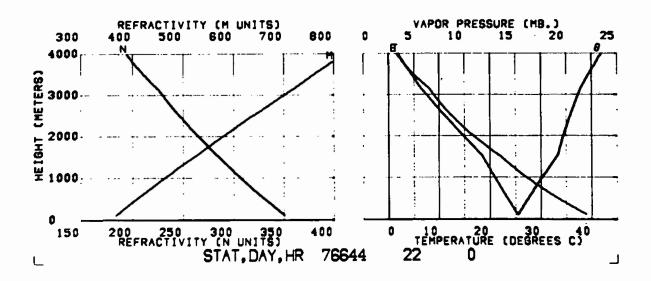


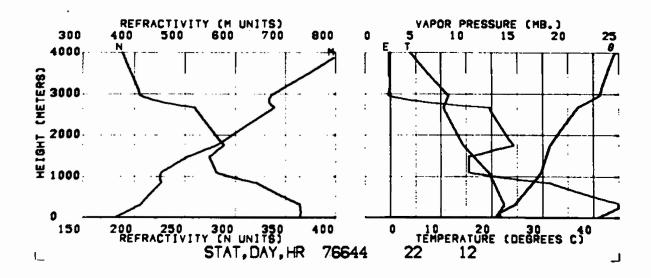


্যু

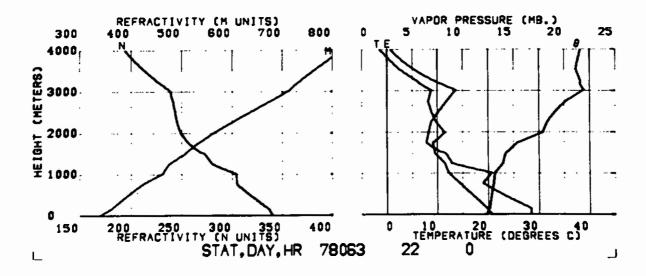


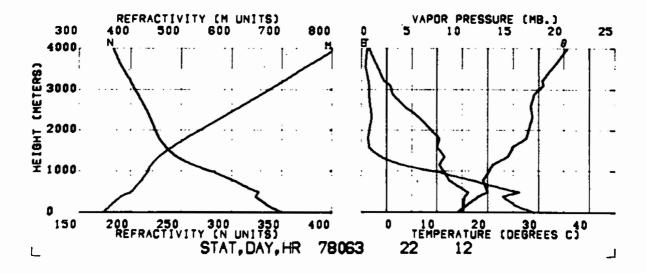


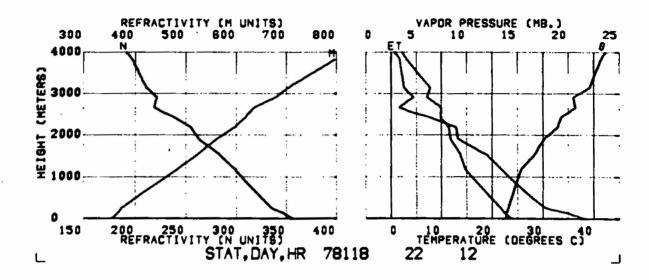


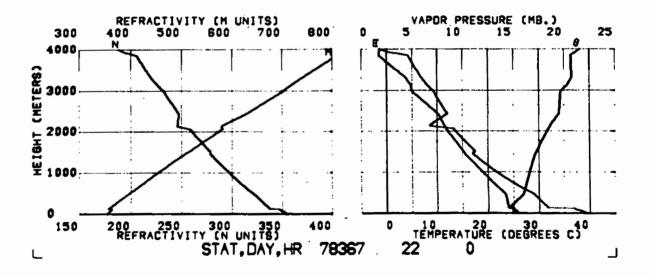


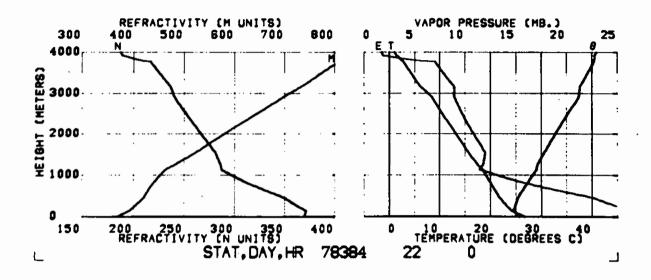
*~ }

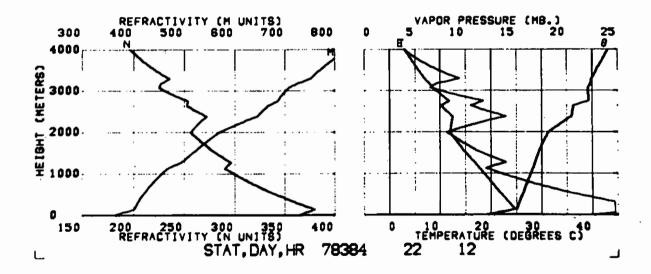


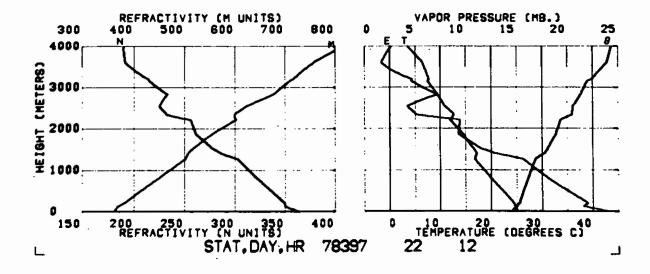


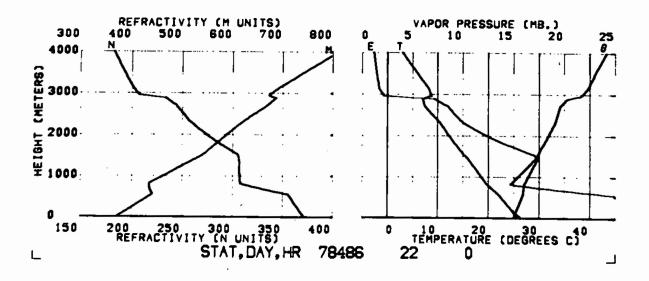


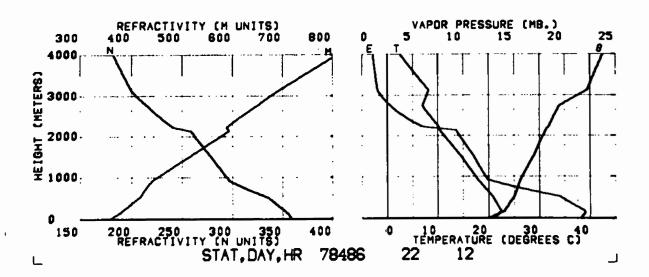


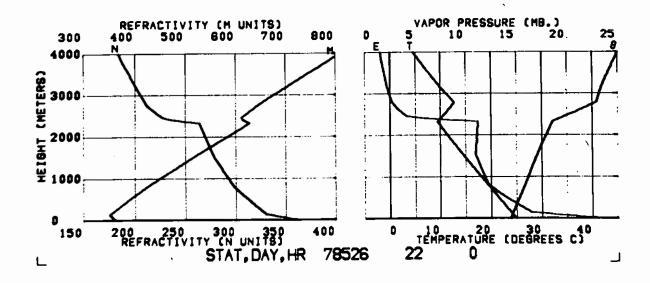


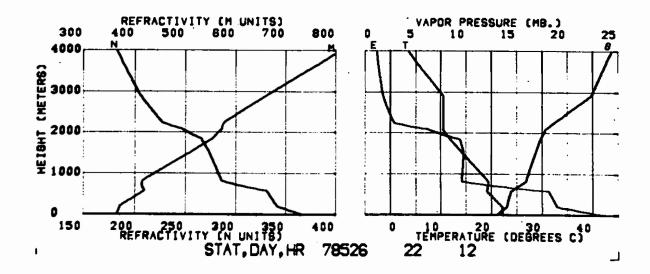


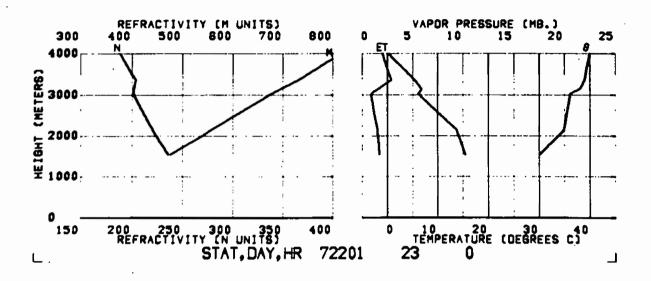


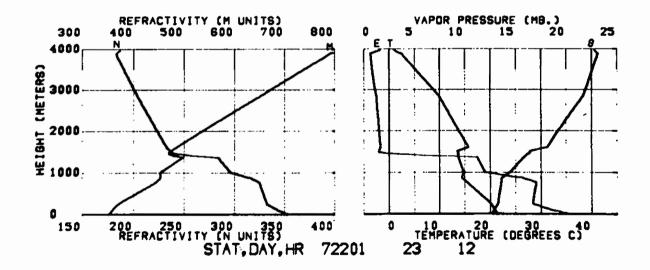




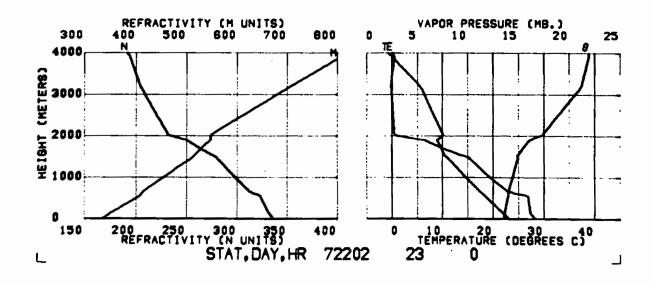


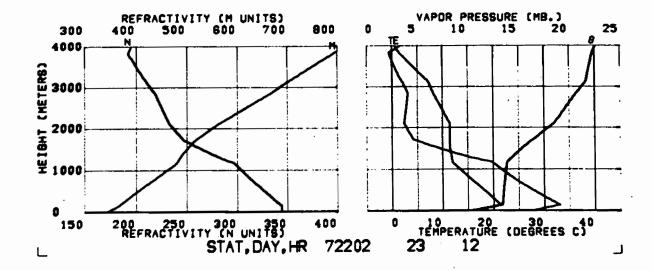


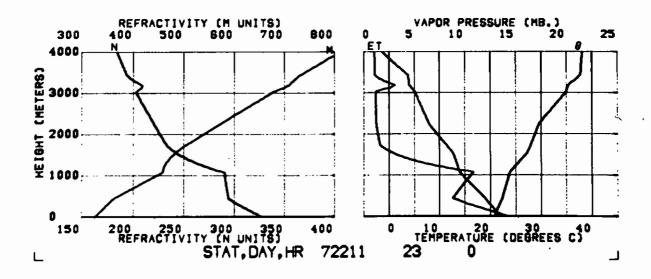


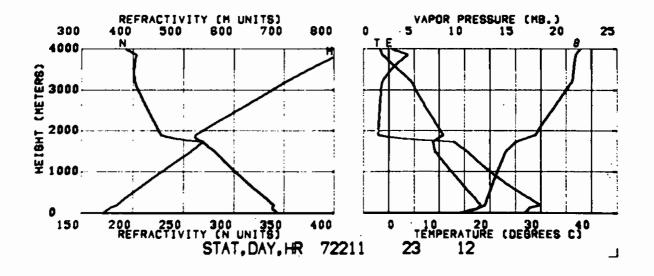


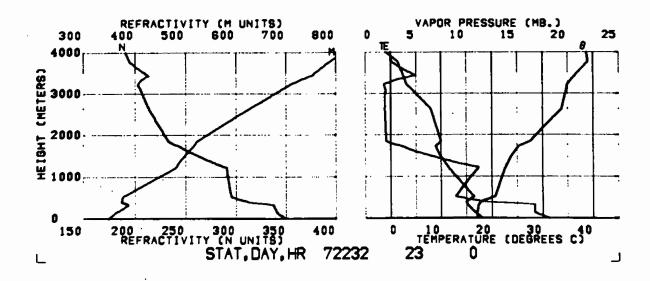
)

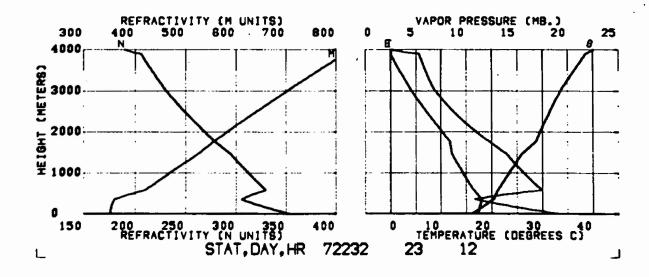


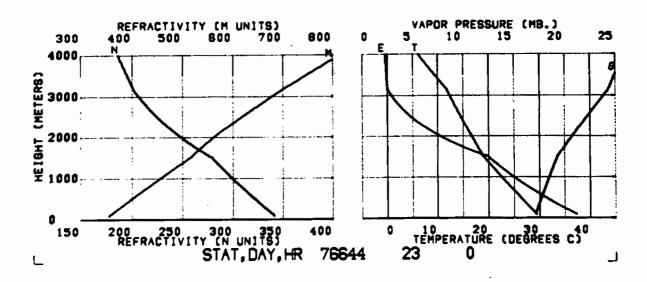


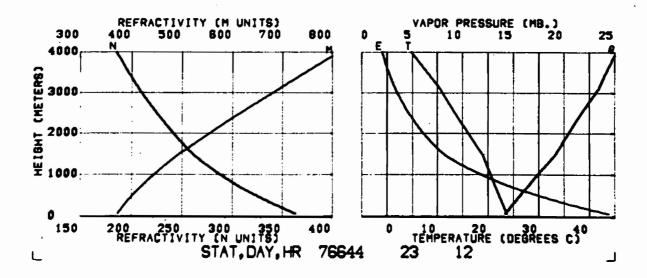


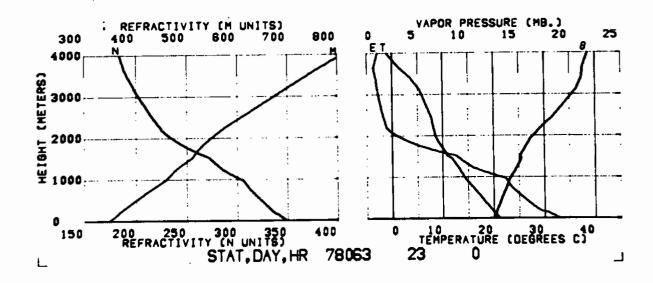


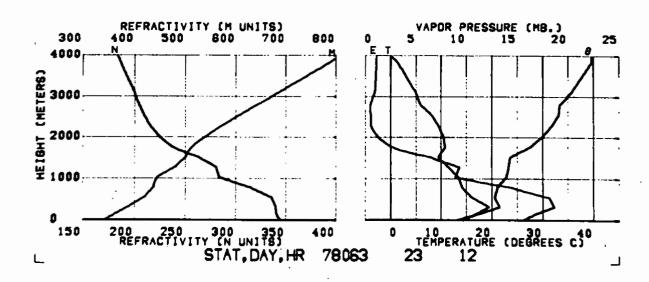


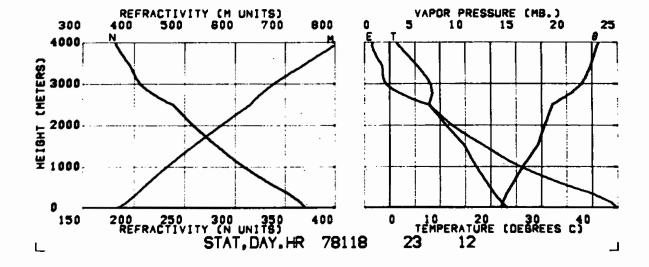


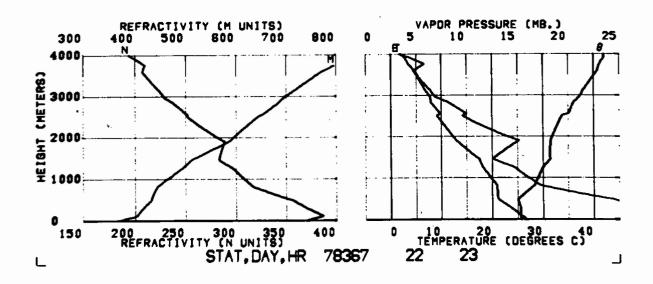


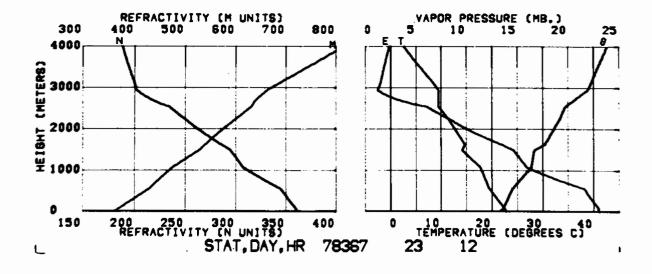


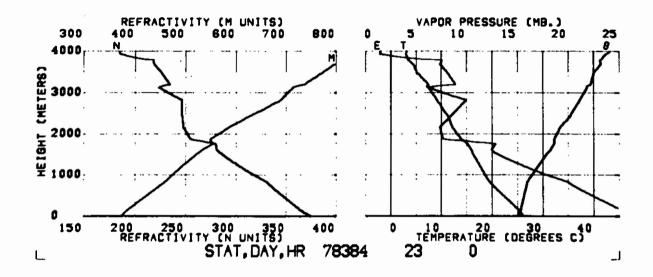


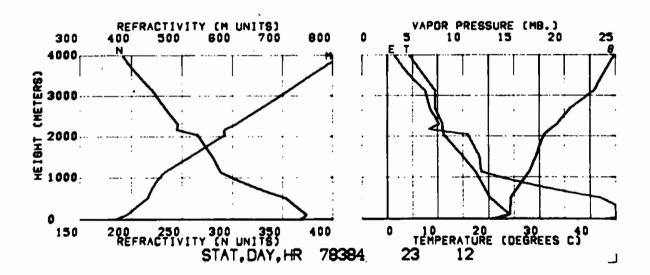


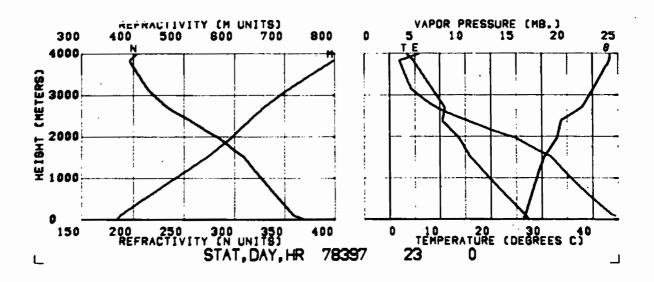


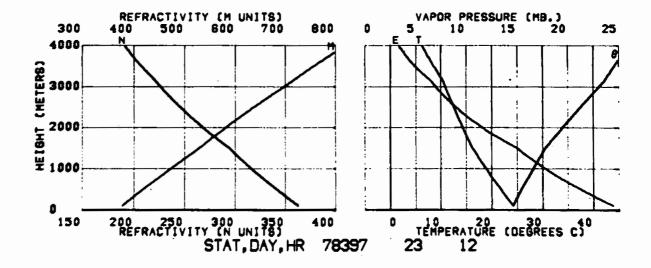


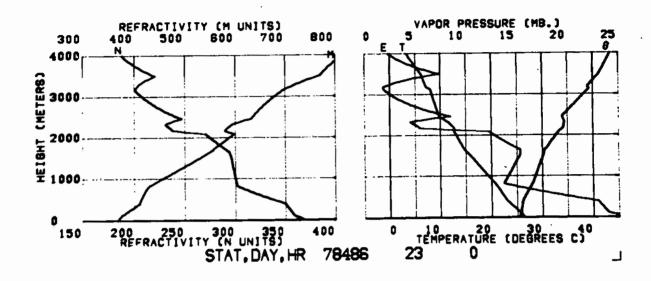


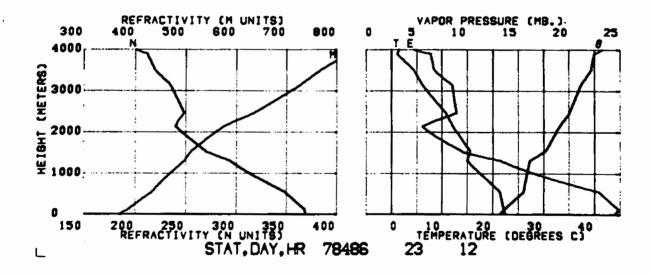


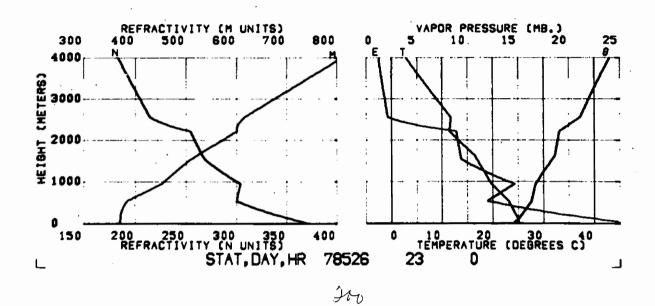


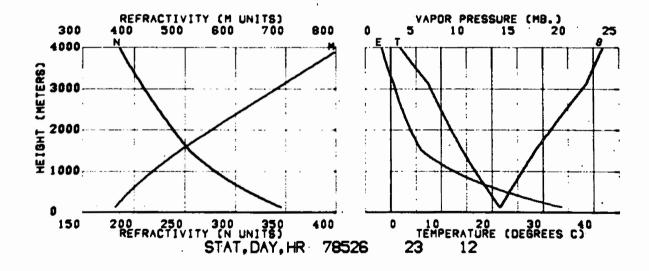


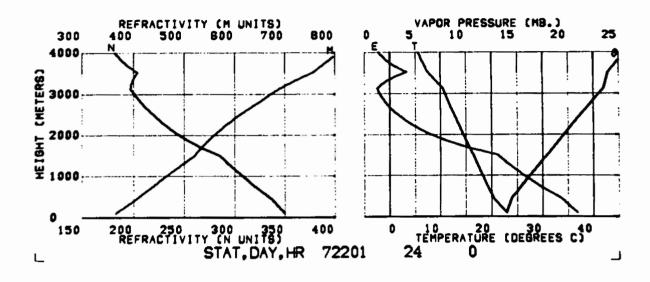


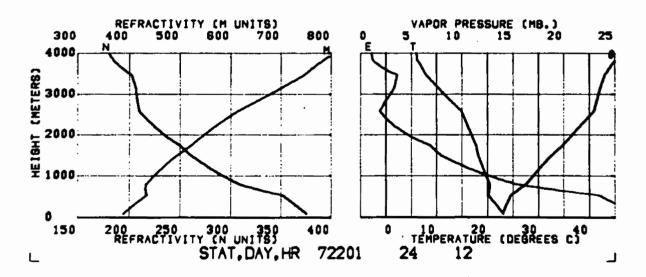




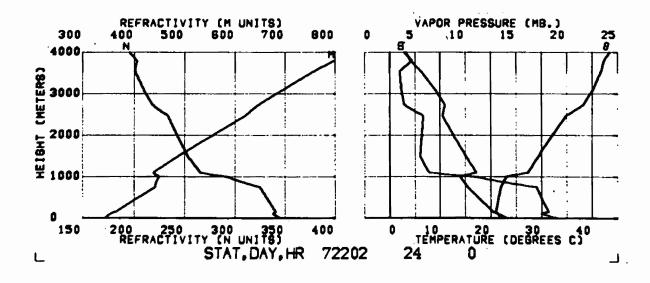


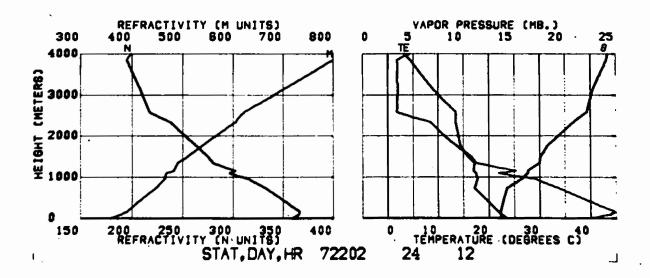


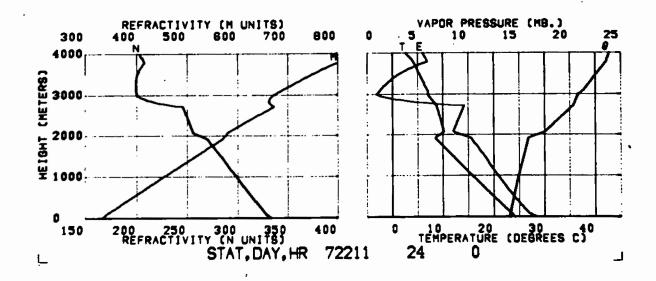


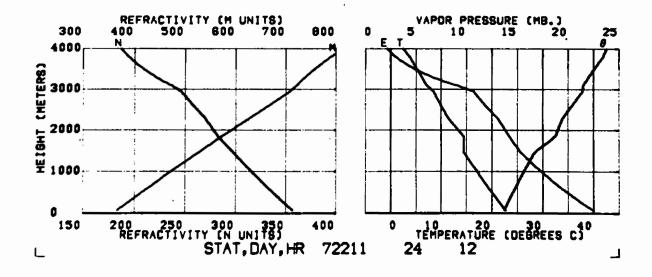


Į.

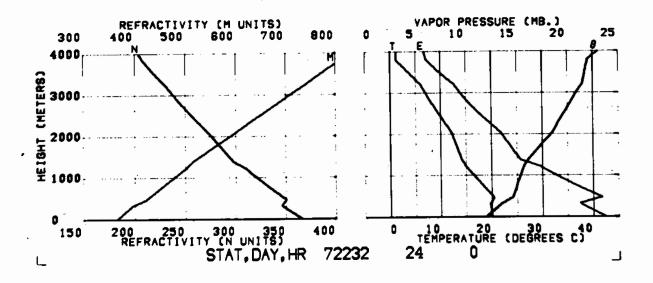


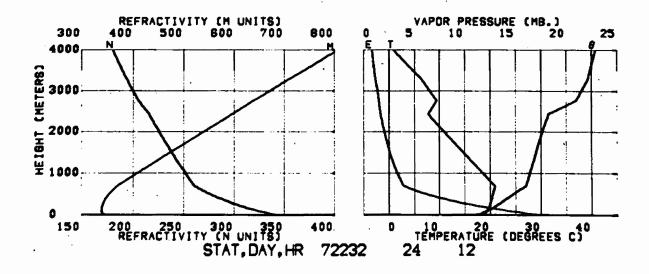


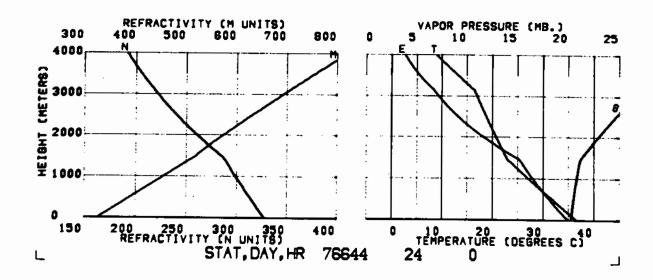


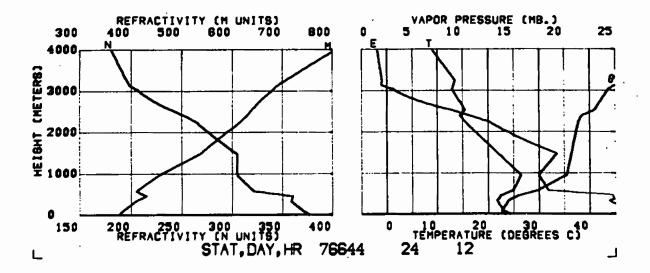


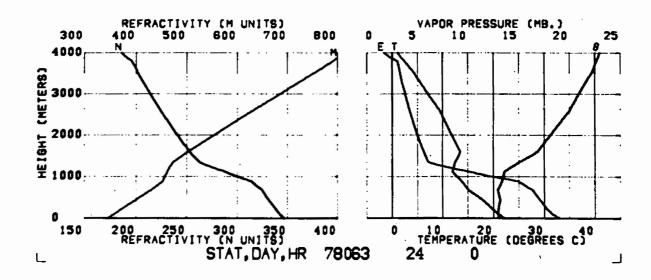
r

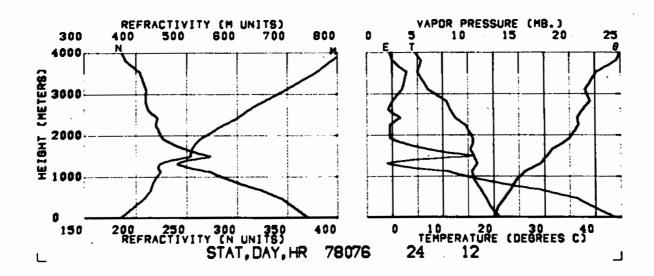


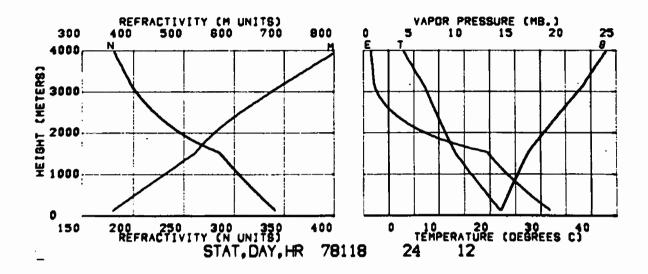


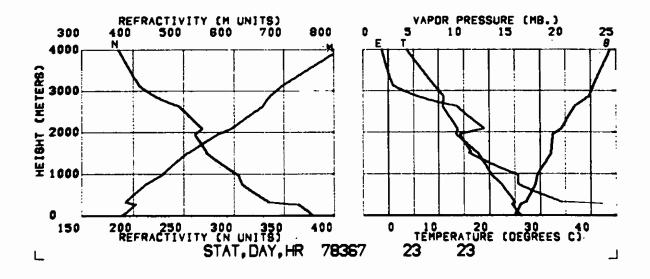


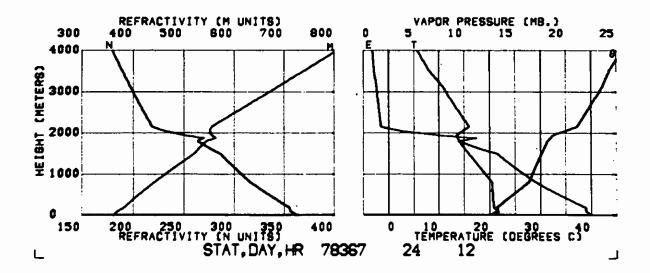


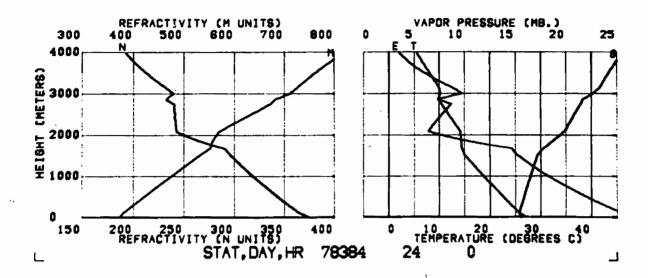


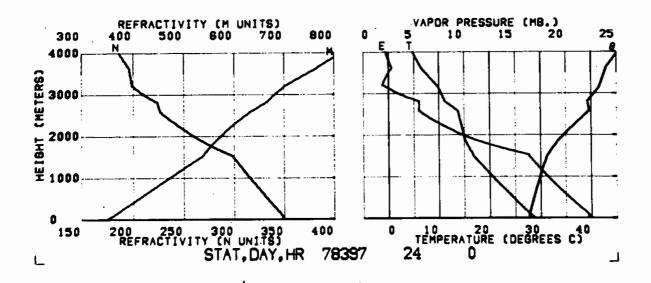


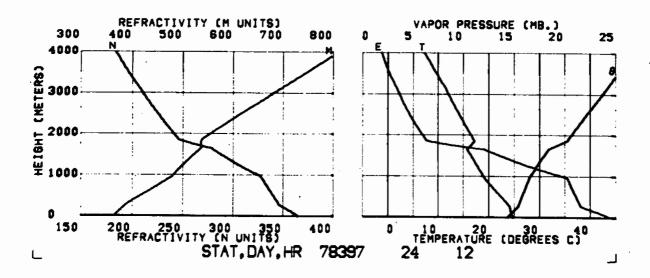


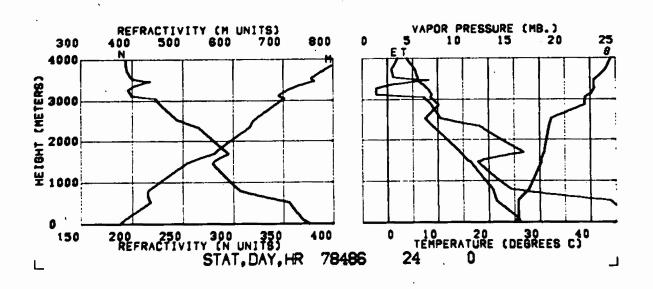


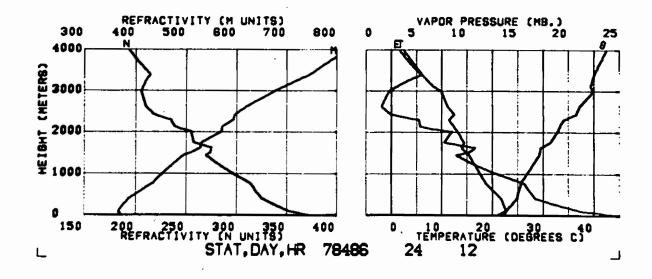


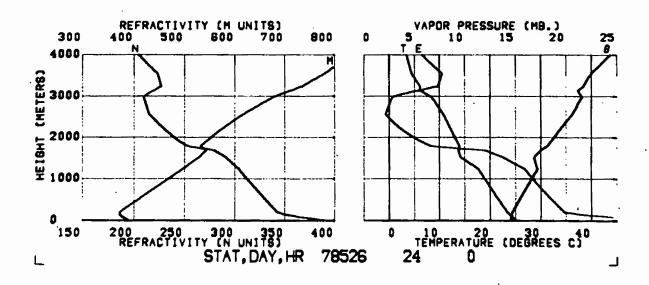


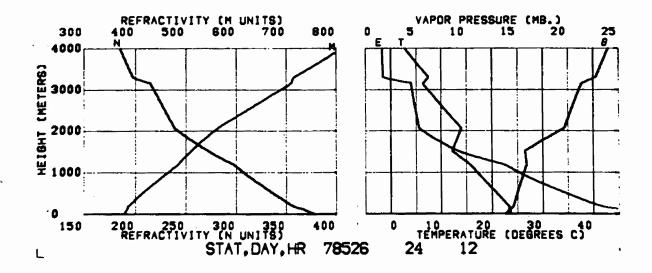


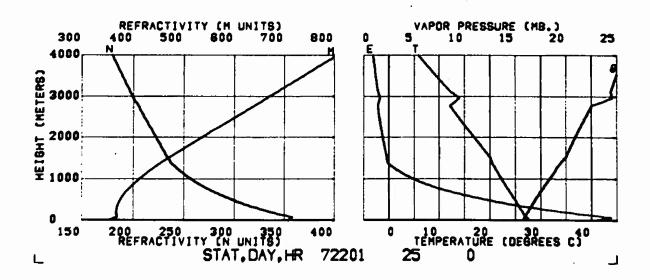


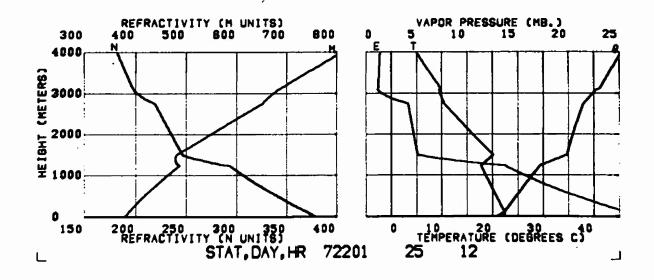


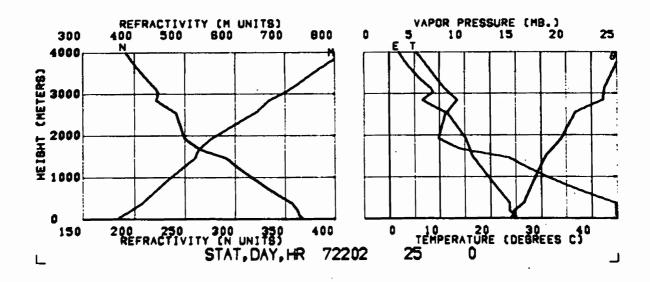


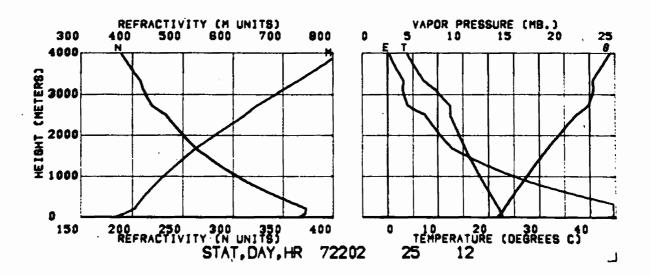


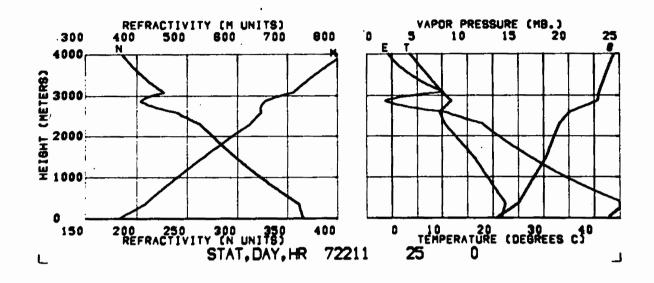


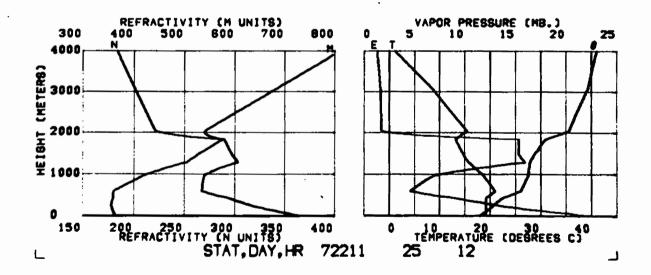




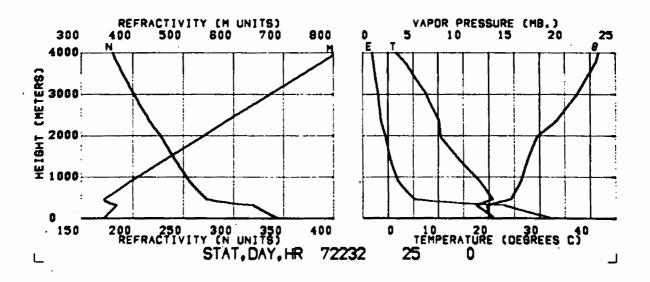


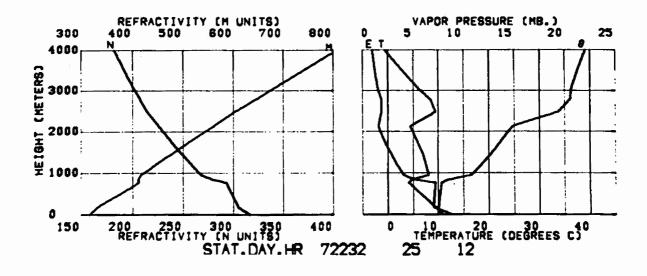


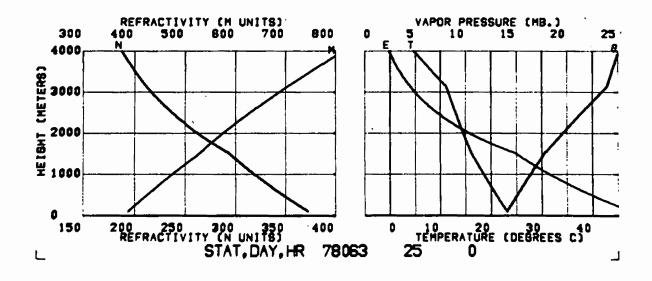


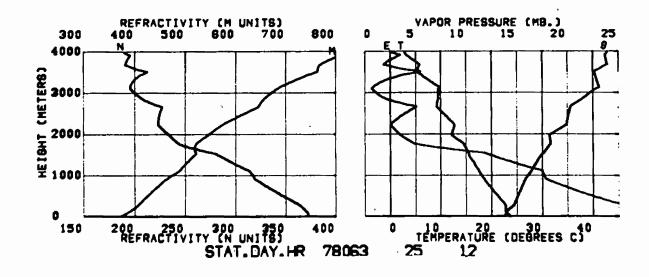


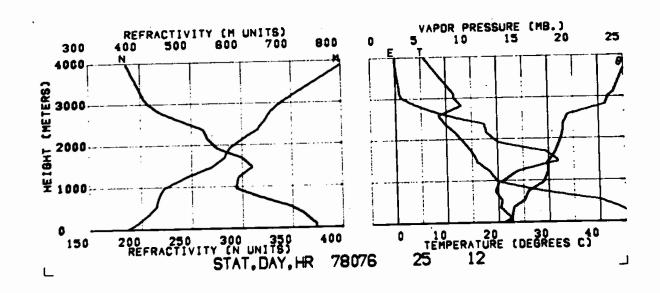
#%

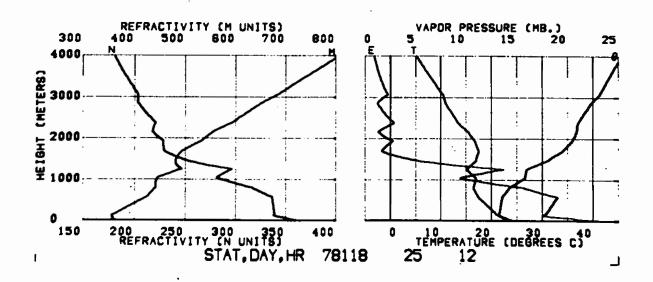


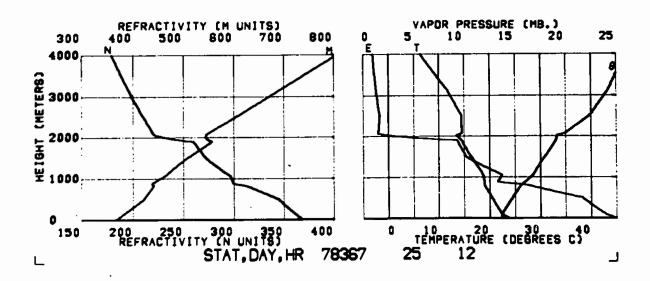


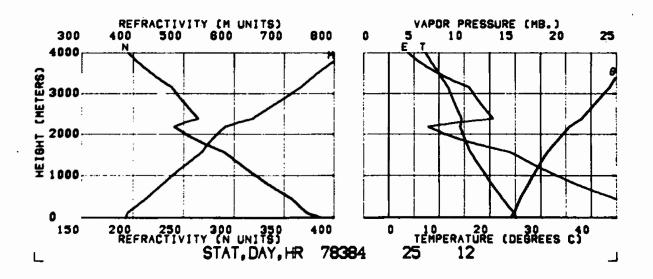


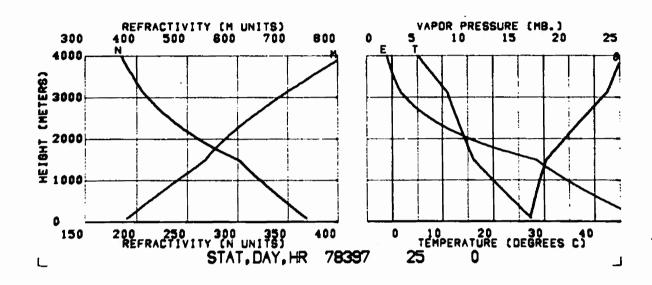


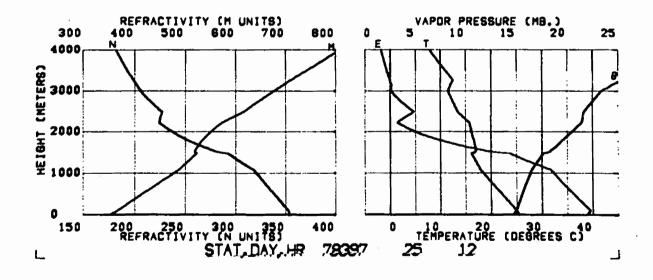


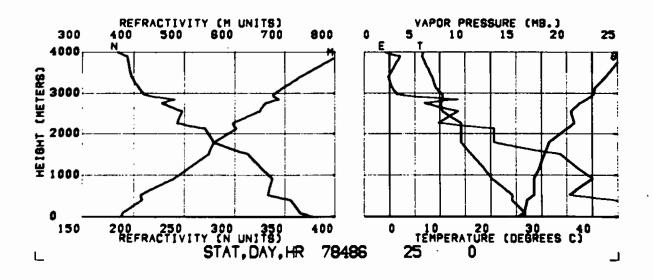


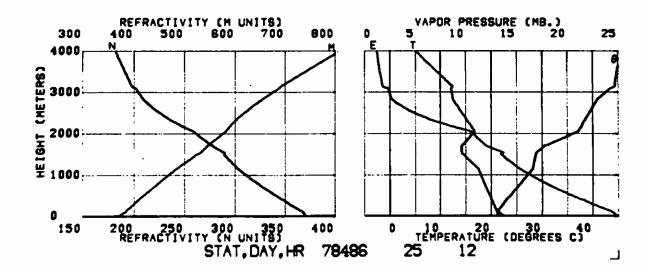


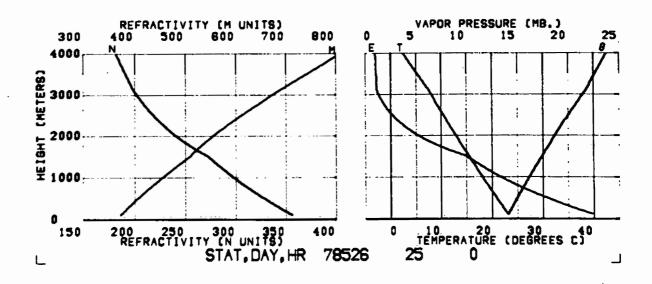


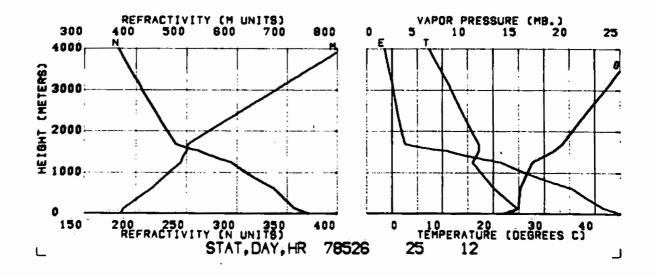




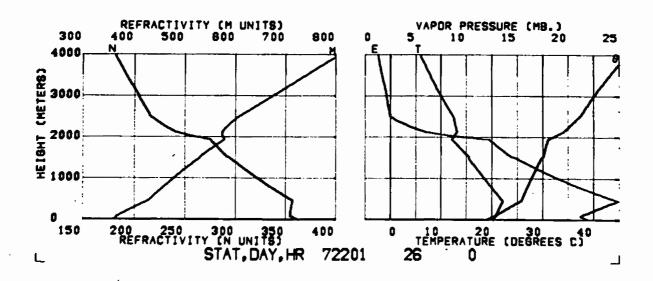


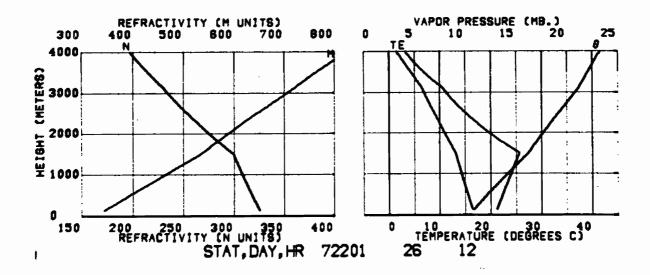


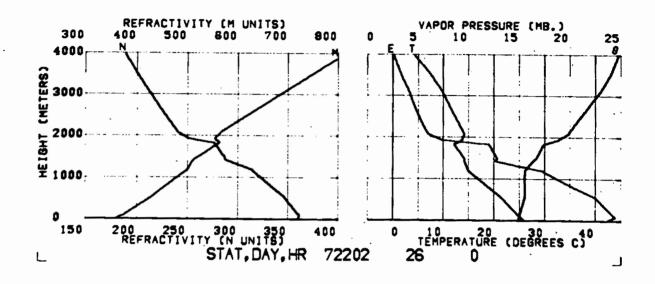


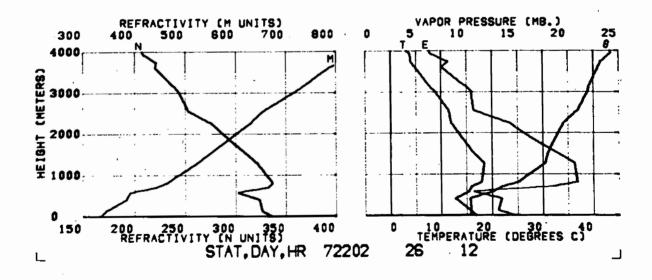


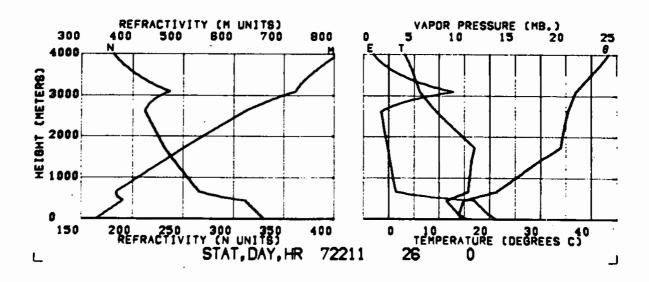
j

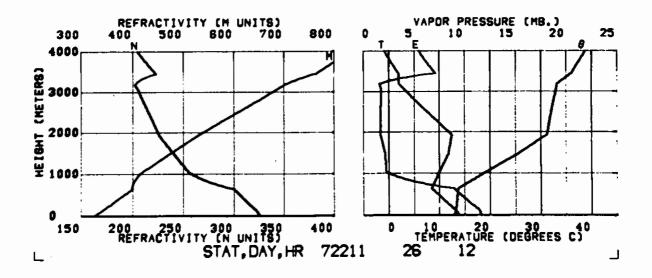


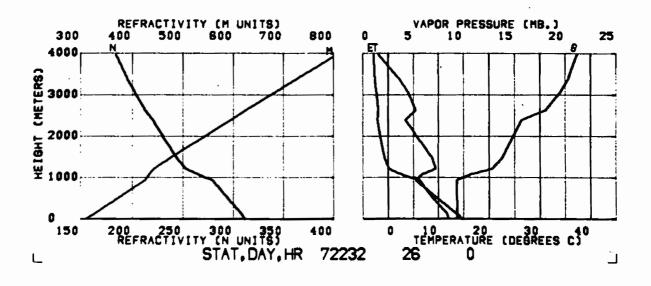


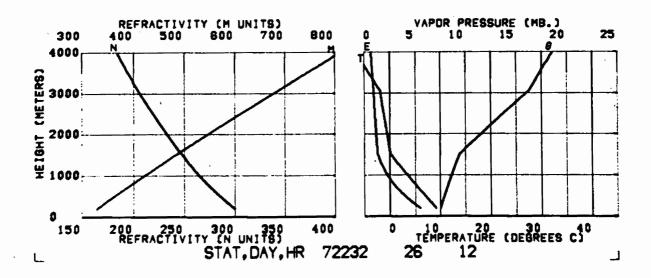




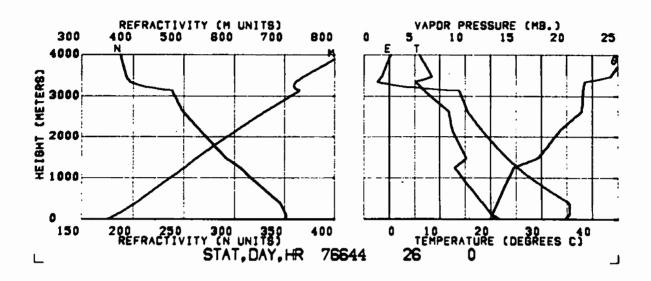


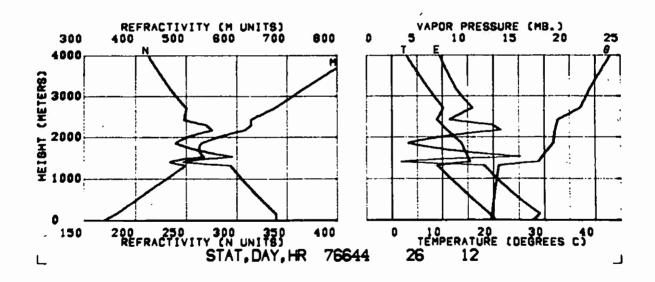


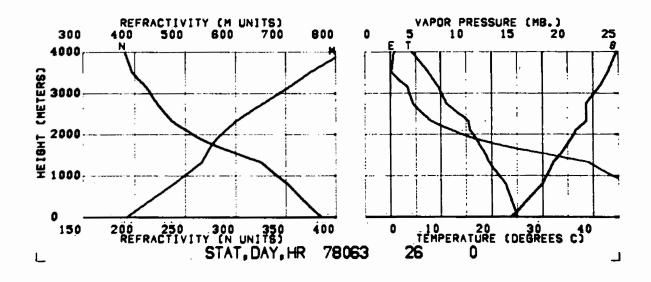


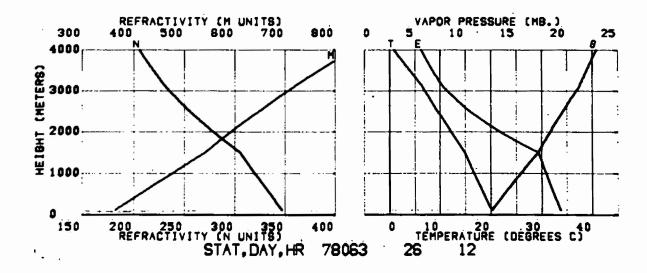


 ζ

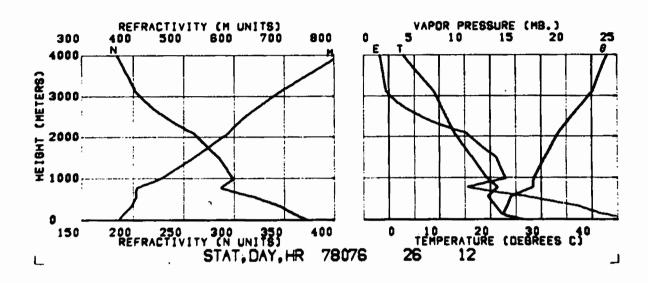


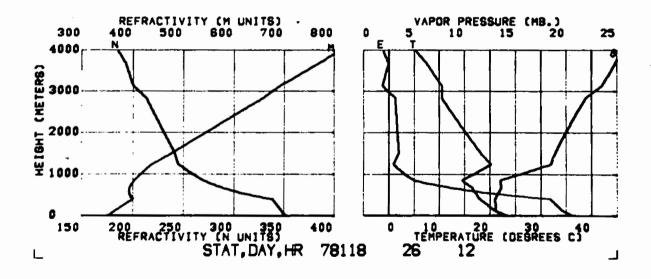


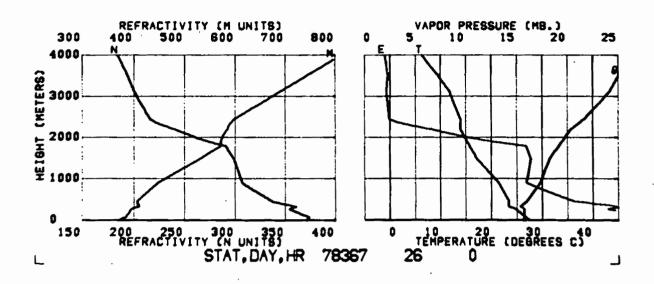


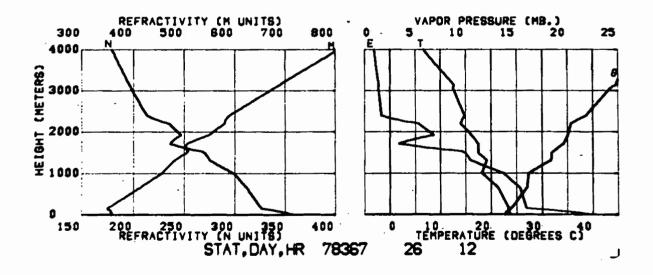


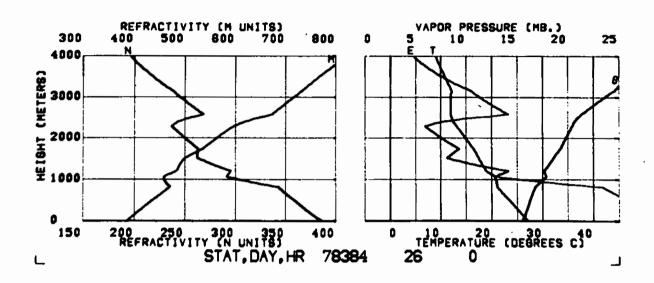
Ĺ

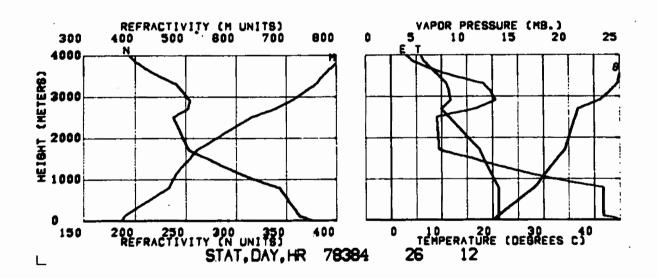




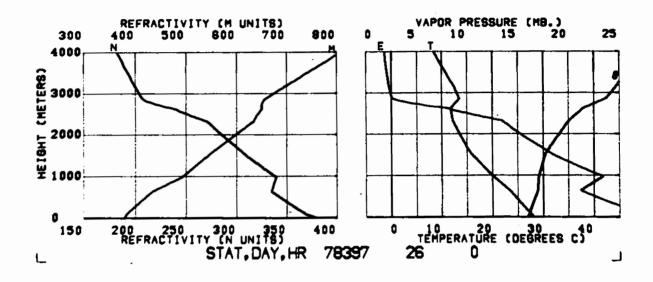


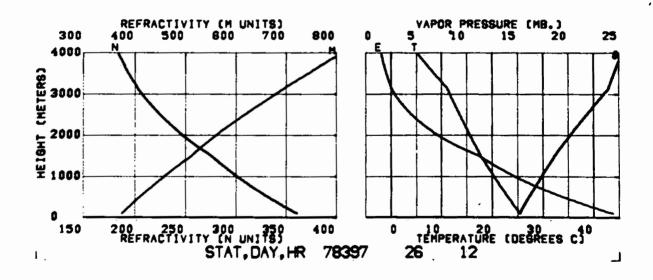


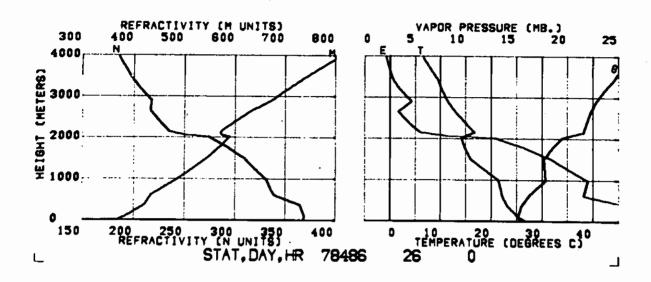


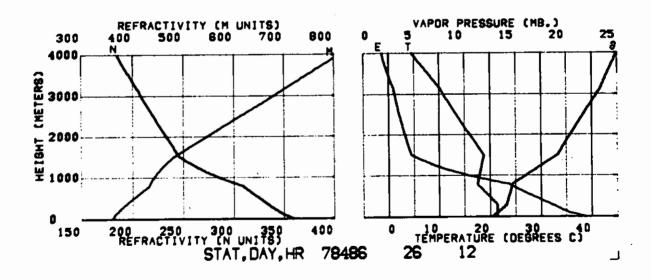


¢°



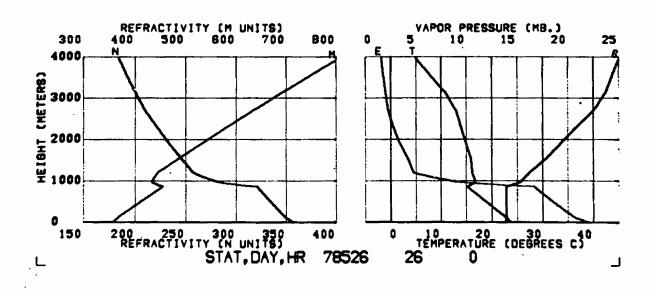


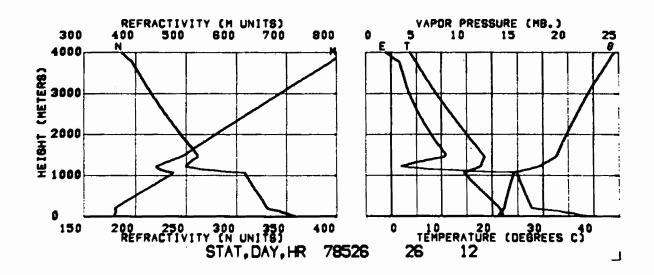




ť"

()





Ŧ,

Ţ,

DOCUMENT CONTROL DATA - R & D (Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)			
1. ORIGINATING ACTIVITY (Corporate author) Syracuse University Research Corporation			CURITY CLASSIFICATION
Merrill Lane, University Heights		UNC	LASSIFIED
Syracuse, New York 13210		2b. GROUP	N/A
3. REPORT TITLE		<u> </u>	147
RADIO REFRACTIVITY AND METEOROLOGICAL DATA PLOTS FROM RADIOSONDE			
LAUNCHES TRADE WINDS - MARCH 1969			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates)			
None 5. AUTHOR(S) (First name, middle initial, last name)			
L. G. Rowlandson			
J. S. Schwarz			
<u> </u>			
6. REPORT DATE	78. TOTAL NO. OF	PAGES	7b, NO. OF REFS
January 1970 88. CONTRACT OF GRANT NO.	. 234	REPORT NUMB	None
F19628-68-C-0209			E H(3)
b. PROJECT NO.	F2r	D-TR-70-60	
·			
c.	9b. OTHER REPOR	T NO(5) (Any off	er numbers that may be assigned
d. 10. DISTRIBUTION STATEMENT	<u>!</u>		
This document has been approved for public releas	e and sale; its	distribution	is unlimited.
11. SUPPLEMENTARY NOTES	Aerospace In	STRUMENTATION	n Program Office,
11. SUPPLEMENTARY NOTES	Electronic Sy	strumentationstems Divisi	n Program Office, on, AFSC, USAF, ford, Mass. 01730
13. ABSTRACT	Electronic Sy L G Hanscom	strumentationstems Division Field, Bed	on, AFSC, USAF, ford, Mass。 01730
73. ABSTRACT Radiosonde data were collected from to during the period 6 March through 26 the encompass the area wherein instrument of meteorological and radio refractivity.	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to
Radiosonde data were collected from to during the period 6 March through 26 to encompass the area wherein instrumen	Electronic Sy L G Hanscom he Northern March 1969. ated aircraft	stems Divisi Field, Bedi part of the Stations	on, AFSC, USAF, ford, Mass. 01730 e Caribbean Sea, were selected to

DD FORM 1473

_ IINCLASSIFIFD Security Classification LINK B LINK C LINK A KEY WORDS ROLE ROLE wr ROLE Refraction Trade Wind Inversion Ducting Meteorology

UNCLASSIFIED